77
TR-2

TEXTILE MANUFACTURER

MATERIALS · PROCESSES · PRODUCTION · MANAGEMENT

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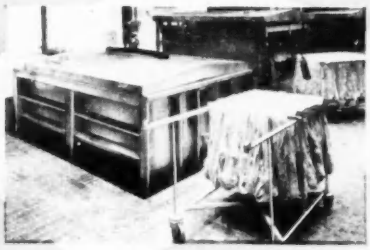
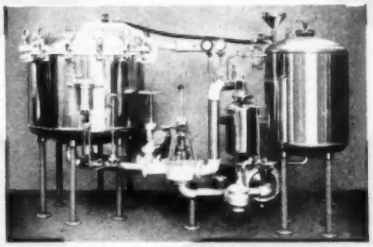


HANK DYEING MACHINES



PRESSURE DYEING MACHINES

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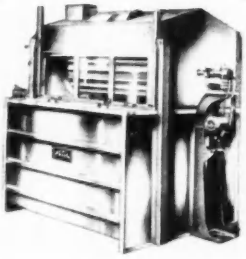
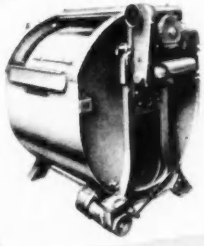
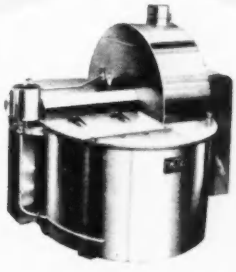


PIECE GOODS DYEING MACHINES

LOOSE STOCK DYEING MACHINES



ROTARY DYEING MACHINES



PADDLE DYEING MACHINES

Builders of dyeing machines for loose stock, hanks, packages, piece-goods, fabric and hose; also finishing machines for all classes of circular knitted and warp loom fabrics and garments. Pre-boarding and finishing machines for nylon hose.

SAMUEL PEGG & SON LTD *A member of the Bentley Group* Barkby Rd · Leicester · England Telephone: 66651 · Telegrams: 'PULSATOR'

I gather Ransome & Marles have a substantial export trade?

Yes. Business overseas has been done for many years through agents and subsidiary companies. Among our biggest customers are many of the newly industrialised countries in Africa and the Far East—countries which are now equipping themselves with machinery at an enormous rate. We also export our bearings to the established industrial areas—to Europe and North America—where our products enjoy a long record of first-class service.

You have, of course, a worldwide network of agents to support this export trade?

We have indeed. Something like eighty agency offices throughout the world. We are concerned, mainly, with providing an unrivalled on-the-spot service for overseas industry. Firstly, we produce bearings that will stand up to arduous conditions of work in every climate. Secondly, local users are thoroughly informed about all the factors affecting the actual running of the bearings. Thirdly, the purchaser is safeguarded with after-sales service. These are our obligations to the foreign manufacturer. I think it is fair to say that we meet them very successfully, because we are constantly expanding our export business and shall continue to do so in the future.

RANSOME & MARLES BEARING CO. LTD • NEWARK-ON-TRENT • ENGLAND

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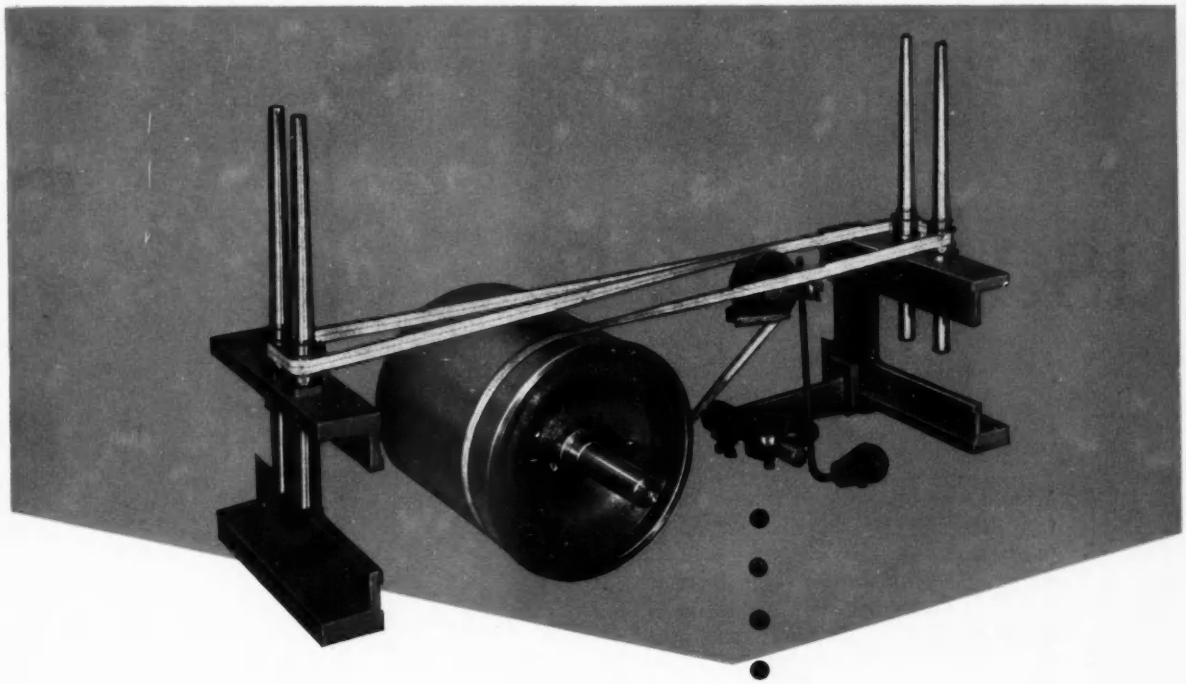

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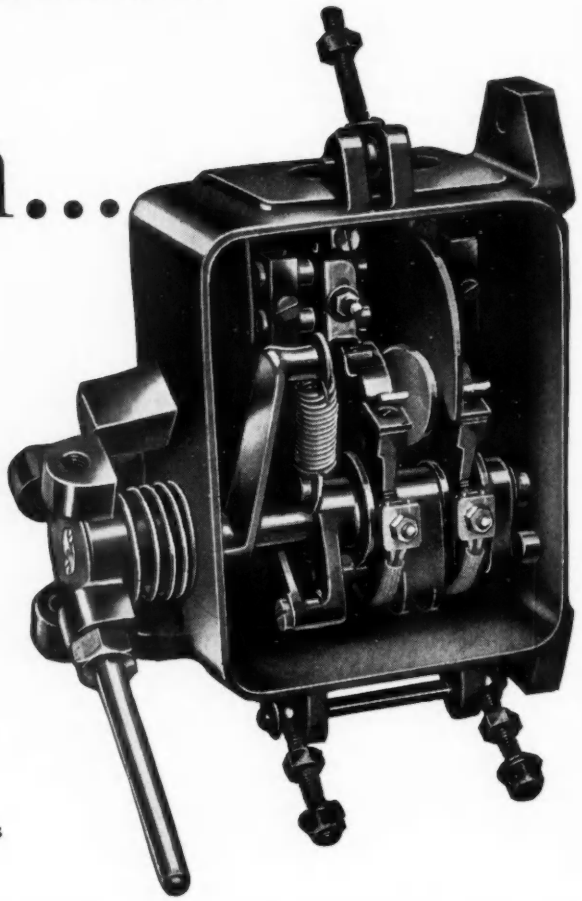
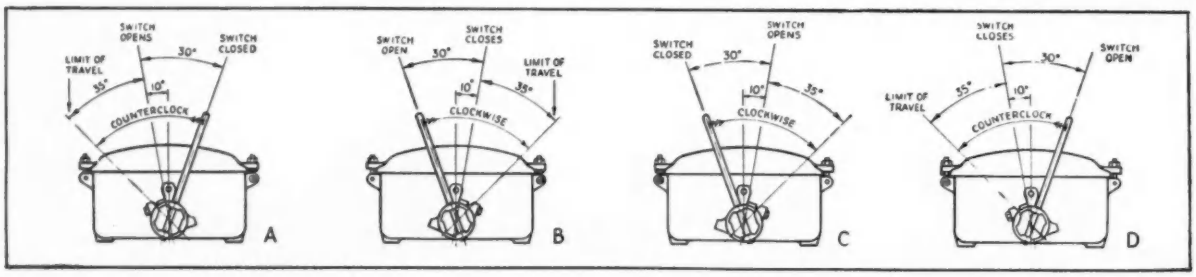
use it much...



When a moment of emergency arises an Ellison tappet operated limit switch can be relied upon to operate with certainty. Whether intended for long periods of idleness, or for frequent operation, an Ellison limit switch is your assurance of security. Whatever the use or the time you will be glad you installed an Ellison limit switch.
Write for List No. 11 for details and illustrations.

DC SERIES LIMIT SWITCH
Single-pole, double break D.C. Made in three sizes for maximum current carrying capacities of 35, 75 and 150 amps respectively at 660 volts.

AC SERIES LIMIT SWITCH
Double-pole in two sizes for maximum carrying capacities for 75 and 150 amps respectively at 660 volts.



ROTATION OF OPERATION OF A.C. SERIES LIMIT SWITCH

A *Switch "normally closed", counter-clockwise operation to "open".*
B *Switch "normally open", clockwise operation to "close".*
C *Switch "normally closed", clockwise operation to "open".*
D *Switch "normally open", counter-clockwise operation to "close".*

YOU CAN RELY ON AN ELLISON PRODUCT

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GEORGE ELLISON
LIMITED
BIRMINGHAM ENGLAND

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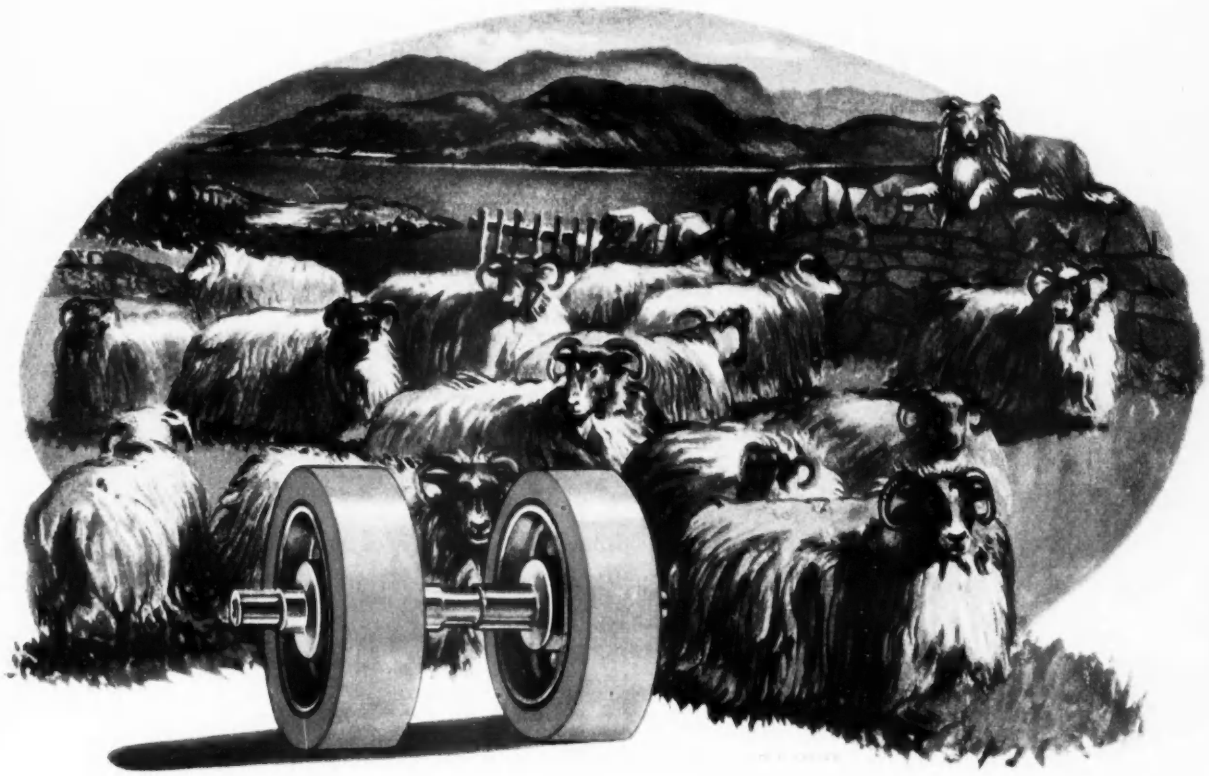
Dayco Worsted Cots

MADE IN SCOTLAND



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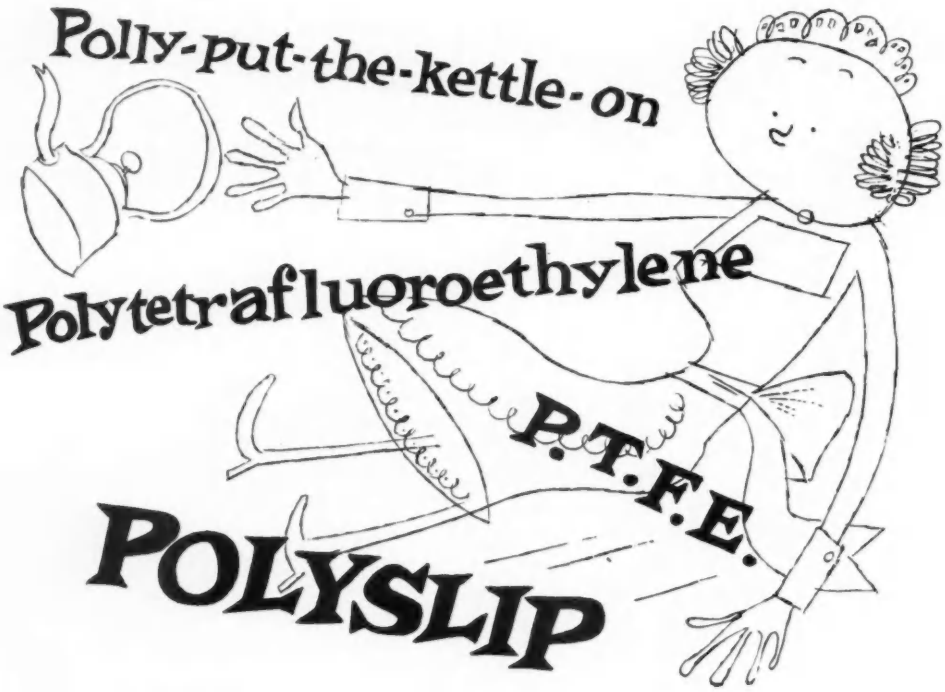
Dayton Rubber Co. Ltd
Dayton Works Dundee

LANCASHIRE SALES DIVISION, SHEFFIELD ST., STOCKPORT. TEL 3464



Let's get this name sorted out first. POLYSLIP is the registered name of an entirely new form of Bound Brook self-lubricating bearing—entirely new in that it incorporates Polytetrafluoroethylene or P.T.F.E. as a *dry* lubricant instead of oil or fluid. Polyslip bearings can be made in shapes and sizes similar to our Compo oil-retaining bearings, but are intended for those applications where petroleum lubricants are undesirable or unsuitable. P.T.F.E. introduces a mechanism of lubrication, entirely different from that employed with conventional dry lubricants and in Polyslip you have the complete, accurately sized bearing, ready to fit without machining or modification. Our Technical Department will be pleased to discuss the application of Polyslip to your own bearing problems and to advise on Polyslip bearing assemblies.

POLYSLIP
DRY LUBRICATION
BEARINGS

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Bound Brook Bearings Limited

Trent Valley Trading Estate, Lichfield, Staffordshire
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Φ4

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If you are interested, write for our new booklet which gives complete specifications of Ashworth formaldehyde and useful information about its handling and storage.

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Phone BURY 51 for ASHWORTH

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Also paraformaldehyde and hexamine

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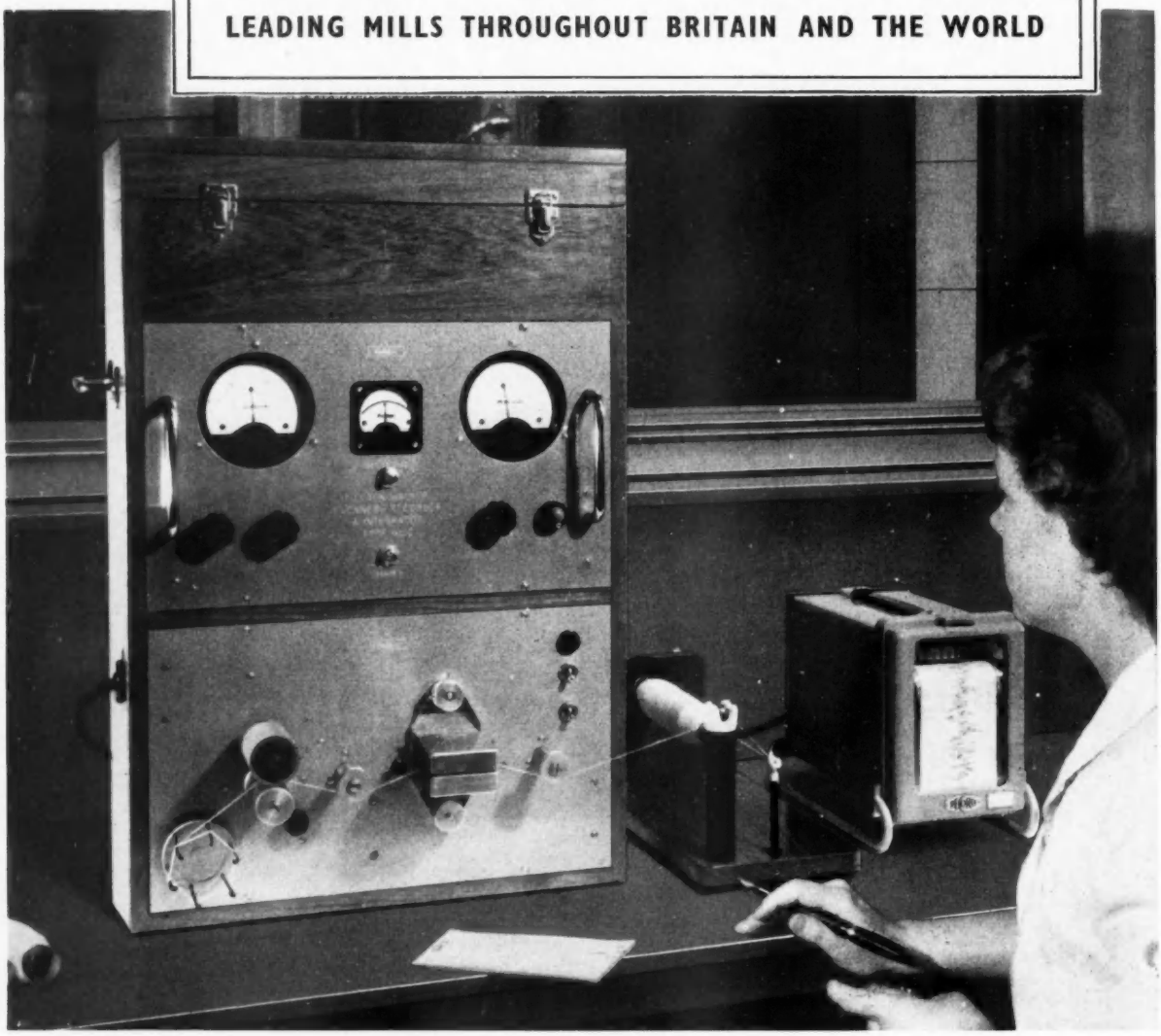
YARN QUALITY IS VITAL

THIS EQUIPMENT HAS RAISED THE QUALITY STANDARD IN LEADING MILLS THROUGHOUT BRITAIN AND THE WORLD



THE FIELDEN-WALKER EVENNESS RECORDER

Modern spinning techniques demand equally up-to-date, really dependable, methods of checking yarn evenness in order for the spinner to maintain complete control and to be able to trace faults quickly and surely. Only the Fielden-Walker Evenness Recorder can give this information about yarn irregularities—and can give it accurately from sliver to yarn.

Write for illustrated leaflet No. 207/T.M.

THE FIELDEN DRIMETER

Automatically maintaining correct moisture content, the Fielden Drimeter improves finish, cuts operating costs, and increases production as much as 40% when installed on a drying machine.

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Uniformity is half the battle

If you are fighting to keep the flag of fashion flying high, make India Mills your ally and the battle is almost won. Uniformity in colours is half the battle, fashion consciousness, novelty and quality of yarn the other half. These things we command, supported by an army of experience equipped with every material advantage. May we serve you?

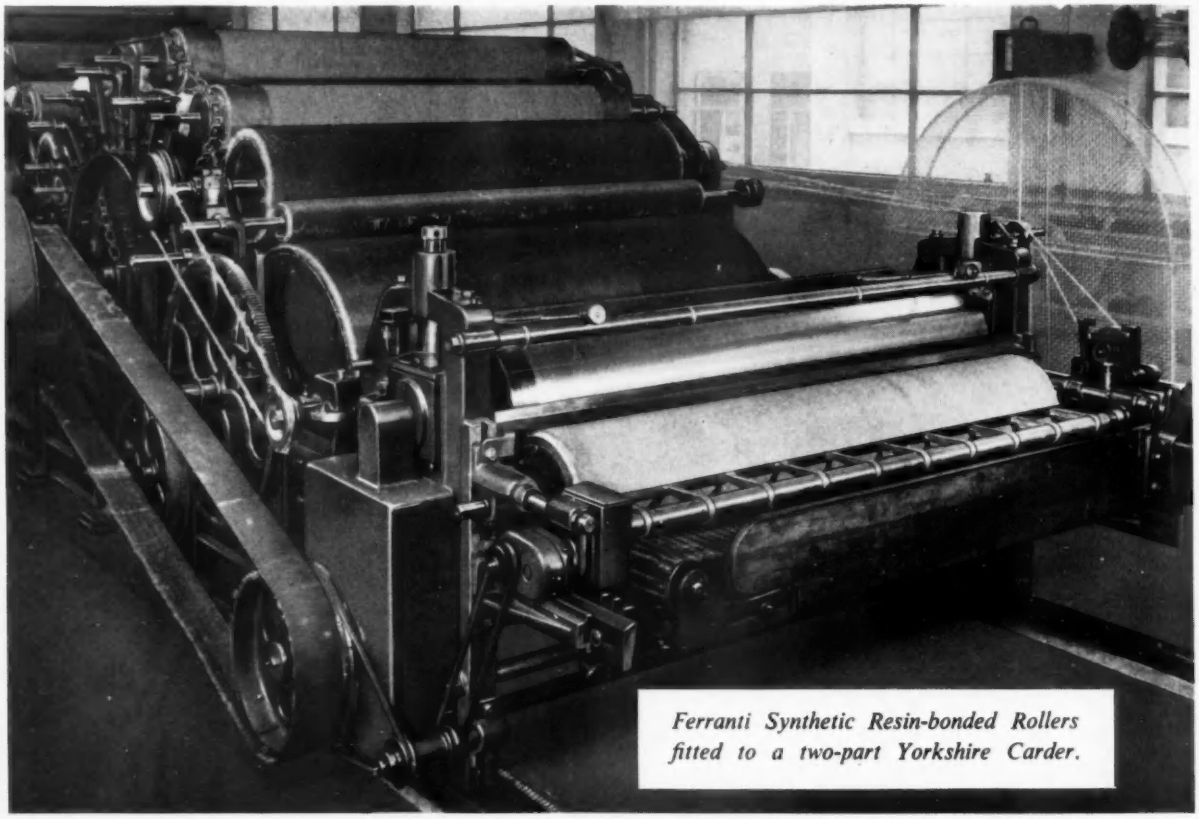
INDIA MILLS

Coloured and Fancy

SPUN RAYON YARNS

Royal English Fusiliers 1742

INDIA MILLS (DARWEN) LIMITED, DARWEN, LANCS



Ferranti Synthetic Resin-bonded Rollers fitted to a two-part Yorkshire Carder.

SYNTHETIC RESIN-BONDED CYLINDERS & ROLLERS FOR THE TEXTILE INDUSTRY

Typical Ferranti Resin-bonded rollers.

Ferranti resin-bonded cylinders for the textile industry have high strength to weight ratio — smooth surfaces — ready machinability — resistance to mild acids and alkalis. These properties are suited to a wide range of applications in the textile field, including preparatory machinery, bleaching, dyeing and finishing processes.

A wide range of resin-bonded tubes for packaging is also available. The great strength of these tubes has been used to advantage in the processing of continuous filament yarns where high crushing stresses are found.

Sizes from $\frac{3}{16}$ in. inside diameter to 6 ft. inside diameter are available with any specified wall thicknesses.

Send for list IDS.2 which describes the cylinders and rollers in full.

FERRANTI LTD

HOLLINWOOD · LANCS

London Office: KERN HOUSE, 36 KINGSWAY, W.C.2

FP1

The experience behind the "Distaff" is now behind the new TASLAN textured yarns

The greatest body of practical technical experience in the country in the production of fine yarns is at the disposal of customers of Fine Spinners & Doublers Limited. Every new advance, from whatever source, is thoroughly investigated, and if adopted is developed to give the most practical and dependable results. The latest Fine Spinners success of this kind is shown in TASLAN Textured yarns, manufactured by them under licence from E. I. du Pont de Nemours & Co.

TASLAN adds qualities, subtracts none

The effect of the TASLAN process is to give continuous filament yarns a bulk and cover which transforms their appearance and handle. Compare microphoto "C" of TASLAN Textured continuous yarn with its all-over distribution of microscopic loops, with the irregular texture of a staple fibre yarn "B" or the smooth continuous filament "A" with its lack of 'loftiness'. Fabrics created from TASLAN yarns are delightfully soft, shadow-proof and warm to handle. They possess all the qualities of the original yarn plus these additional advantages.

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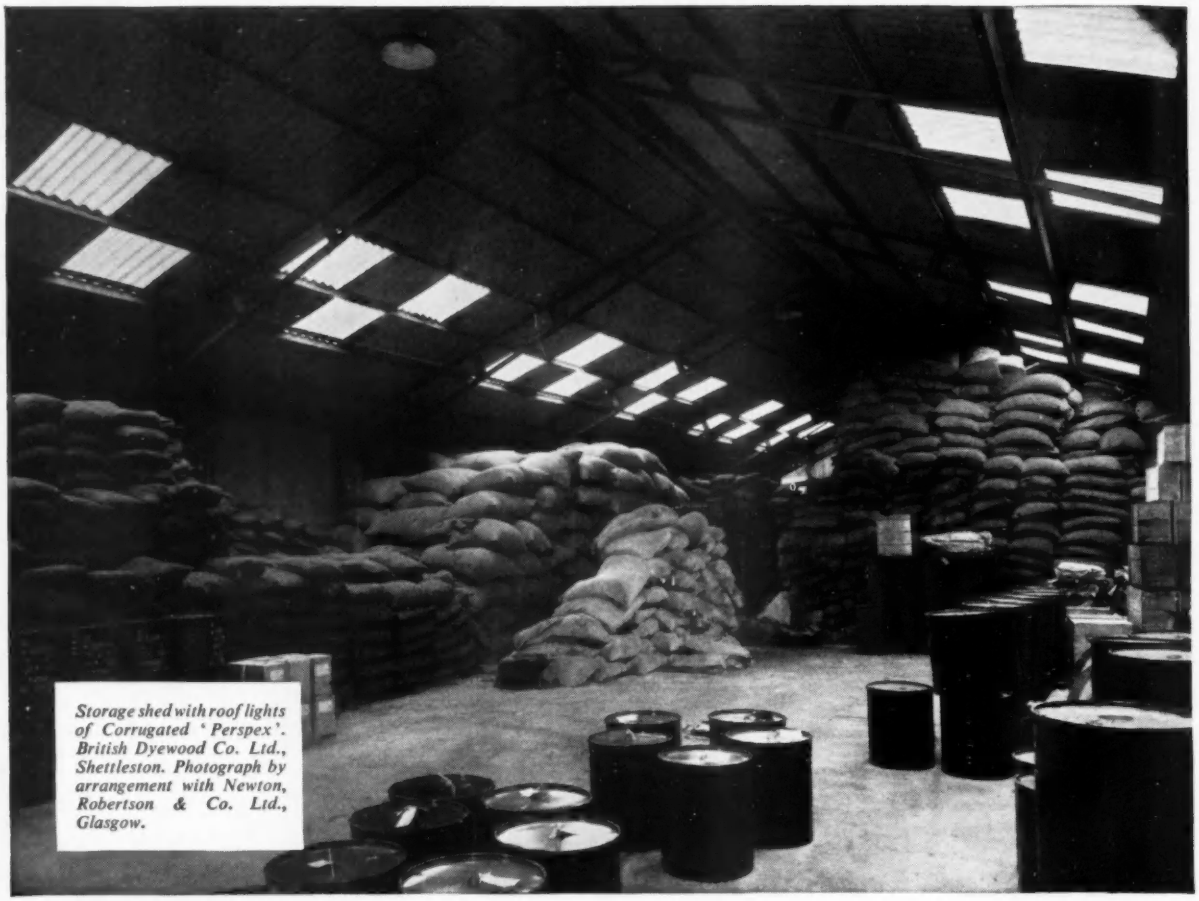
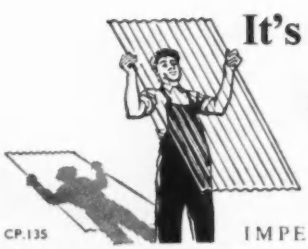


Storage shed with roof lights of Corrugated 'Perspex'. British Dyewood Co. Ltd., Shettleston. Photograph by arrangement with Newton, Robertson & Co. Ltd., Glasgow.

Wherever there's a corrugated roof— this is the best roof lighting

GOOD ROOF LIGHTING, that makes the most of all available daylight, means a big saving on artificial light. In all storage sheds, workshops and other buildings with corrugated roofs the best roof lighting material is Corrugated 'Perspex' acrylic sheet. Good lighting means increased efficiency and better health for workers.

Corrugated 'Perspex' is light, tough, easy to handle, and inexpensive to install. It will stand up to weather conditions in any part of the world and it is not harmed by the corrosive atmospheres in industrial areas. If diffused daylight is desired, Opal 'Perspex' is available. Originally developed for intense light conditions overseas, Opal Corrugated 'Perspex' diffuses daylight evenly and efficiently.



It's as clear as daylight—it must be

CORRUGATED 'PERSPEX'

'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.

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This famous factory is using

PETRIE & McNAUGHT

Machinery

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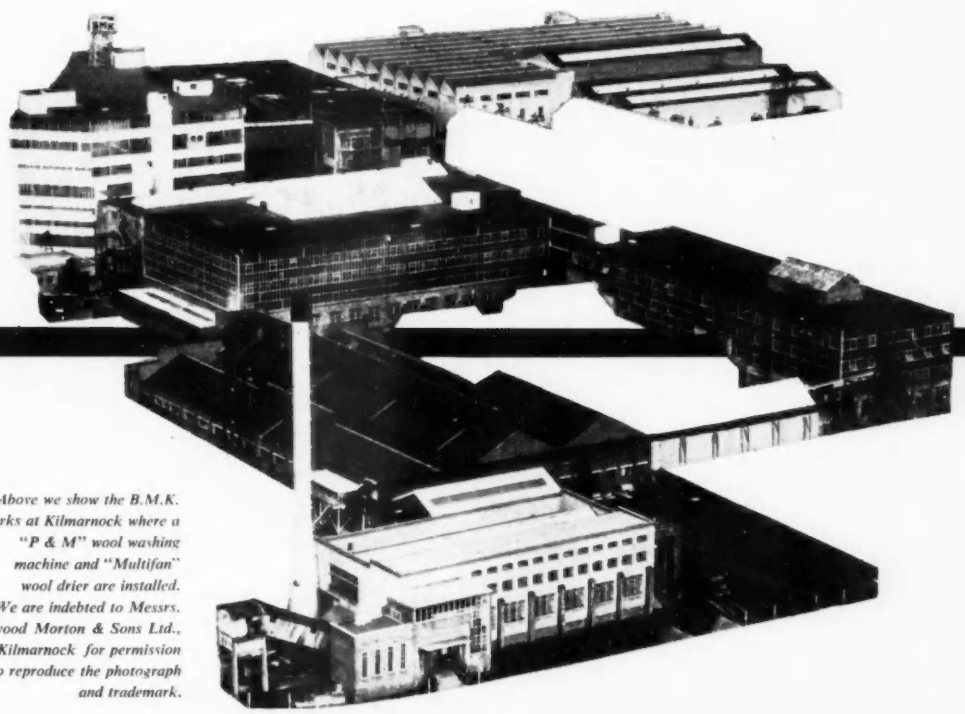
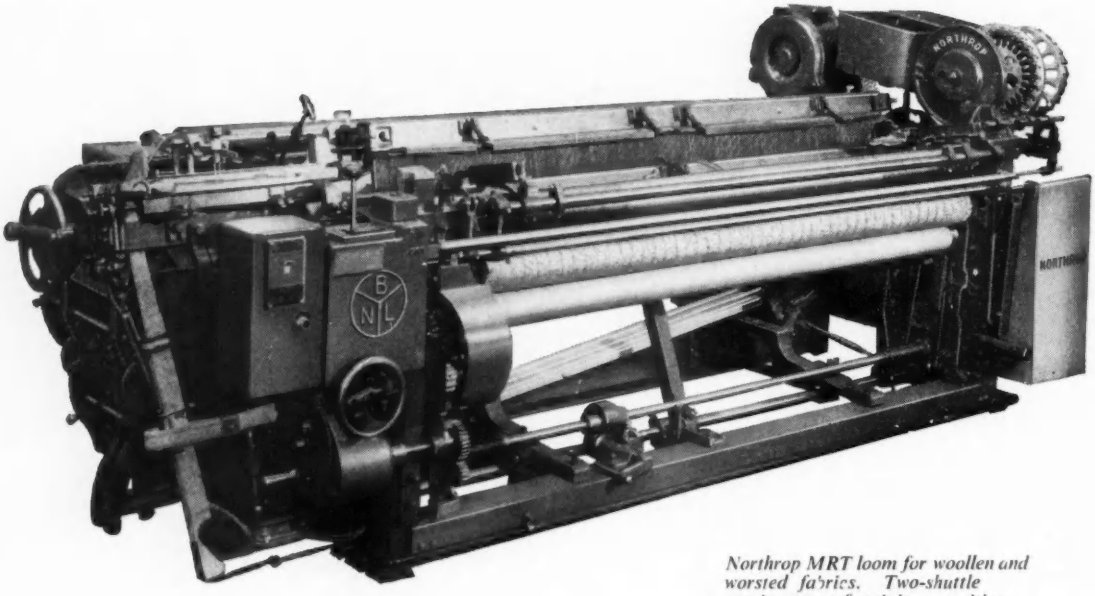
Always in the forefront of design, we are proud of the fact that so many of the famous names in the textile industry have chosen "P & M" machines for their initial processes. Whenever the washing and/or drying of textile fibres is under consideration we will place at your disposal the experience we have gained in the trade since Mr. John Petrie Junr. designed the first automatic wool washing machine in 1853.

PETRIE & MCNAUGHT LTD.
Crawford Street, Rochdale.



Above we show the B.M.K. works at Kilmarnock where a "P & M" wool washing machine and "Multifan" wool drier are installed. We are indebted to Messrs. Blackwood Morton & Sons Ltd., of Kilmarnock for permission to reproduce the photograph and trademark.



Northrop MRT loom for woollen and worsted fabrics. Two-shuttle continuous weft mixing; positive cam-shedding, and positive worm take-up motion.

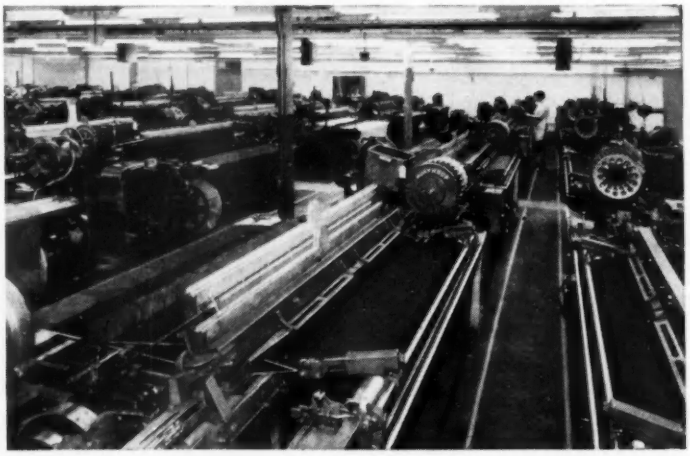
The NORTHROP MRT MODEL LOOM

- *designed and built to operate at high speeds*

THE NORTHROP MRT MODEL LOOM a low-built, topless, all-purpose loom, convertible from single shuttle to 2-box check, or 4-box check, or 2-box continuous weft-mixing.

THE NORTHROP MRT MODEL LOOM built with positive cam shedding motion, or negative cam-controlled dobby, or positive dobby.

THE NORTHROP MRT MODEL LOOM a loom to weave varying widths, designs and qualities of cloth of cotton, staple fibre, linen, wool, filament rayon and other man-made fibres.



"WEAVE WELL ALONE!"

THE BRITISH NORTHROP LOOM COMPANY LIMITED

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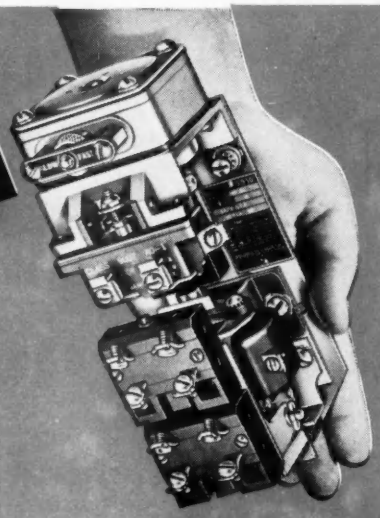
Square D
Design Leadership in action

3 New timers



New . . . Type B

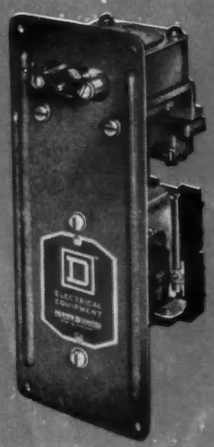
Now with narrow base for space saving

Class 9050 Pneumatic Timers, the machine tool standard for more than 20 years—are now improved to save 35% of mounting space. As before, the A.C. timers have a range from 0.2 seconds to 3 minutes and accommodate up to 2 n.o. and 2 n.c. auxiliary switches. Available for panel mounting or a variety of enclosures.

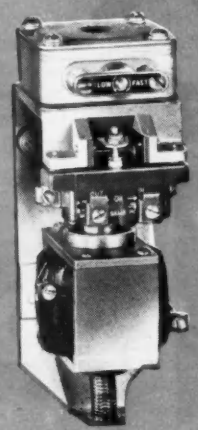
New . . . Type B

Flush Mounting Timer

Ideally suited for mounting in enclosures or doors where external adjustment is desirable. This A.C. Pneumatic Timer has a heavy sheet steel flush plate and the same range, and high degree of repeat accuracy as all Square D Timers. Type B Timers are convertible from time delay after energisation to after de-energisation. Designate as Class 9050.



Whatever your timing problem— one of these timers will do the job— *Precisely!*



New . . . Type C

D.C. operated

Using the identical timing head as the Type B, these Type C Timers have a D.C. operated magnet for voltages up to 250 Volts D.C. Types B & C Timers are available with micrometer dial or knurled knob adjustment. Also, designate as Class 9050.

Write for Timer Bulletin 9050

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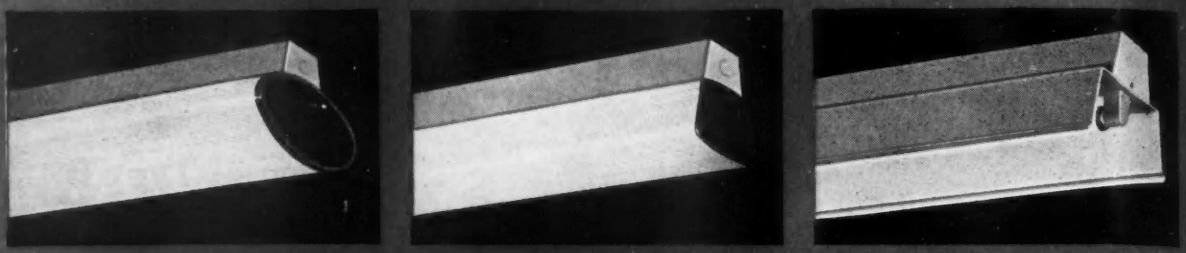
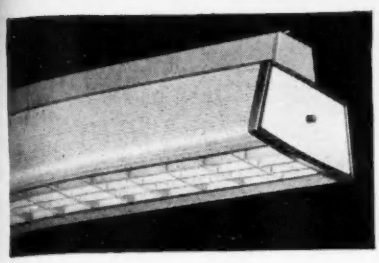
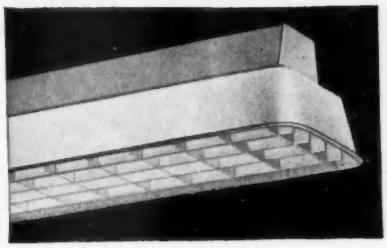


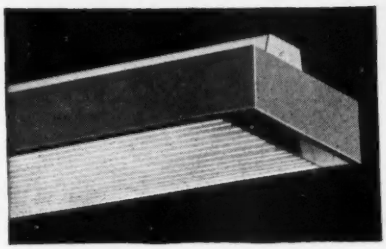
what's so new about fluorescent fittings

THE GENERAL ELECTRIC CO. LTD.,

MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.







these anyway?

Everything is new! *The '101 Range' is an entirely new range of contemporary styled industrial, commercial and decorative fluorescent fittings. The successful result, in fact, of team work between G.E.C. fittings designers and illuminating engineers. Competitively priced—outstandingly modern in conception! NEW also is the introduction of basic channels for single or twin tubes, 1½ ft. to 8 ft. which, with specially designed attachments, form an interchangeable system of great versatility with particularly simple installation and maintenance. It is important that you learn all about this exceptional range —the '101 Range'—of G.E.C. fluorescent fittings, so write for fully descriptive catalogue No. F 4068.*

new adaptability

The G.E.C. '101 Range' sets a *new standard* of adaptability. Using as a basis, channels of common cross section, industrial, commercial and decorative fittings are built without a multitude of small parts. Each is a soundly engineered fitting, of modern appearance and incorporates many aesthetic and mechanical refinements. Installation and maintenance are absolutely simple.

new reflectors

For the first time the industrial user can have vitreous enamelled closed end trough reflectors made from a single pressing, with well-rounded corners and without joints. They are therefore particularly easy to clean. New techniques enable them to be made lighter than previous types and therefore easier to handle and less susceptible to damage.

new 8 ft. tubes

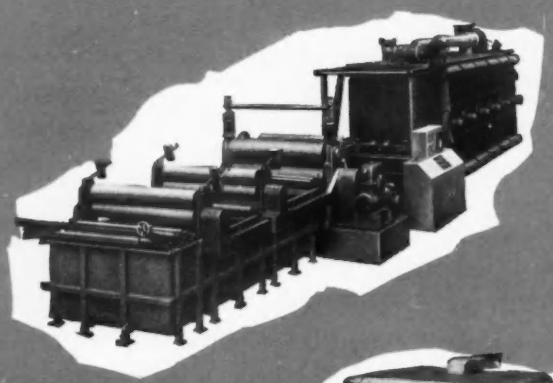
Recessed double contact (R.D.C.) caps are fitted to OSRAM 8 ft. 125 w. tubes for use in the '101 Range'. This new cap design protects the tube ends and allows replacement by one person from one ladder position. Recessed double contact caps also provide firm, reliable support and location for these tubes without relying on contact pins or independent clips. This results in easier tube replacement after cleaning or maintenance. Unsightly shadows are reduced, as the new cap gives a smaller "dead region" at tube ends. Osram Guaranteed Tubes, with their freedom from early failures, are recommended for all G.E.C. lighting fittings.

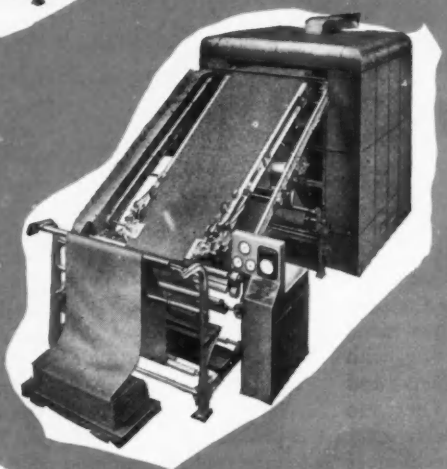
G.E.C. range 101

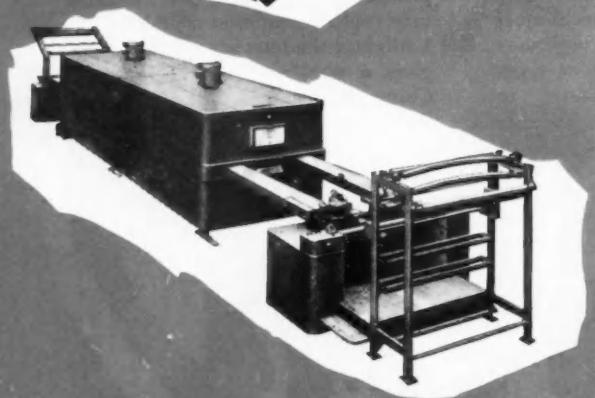
fluorescent fittings

THE REALITY OF A COMPLETE LIGHTING SERVICE

Talented Threesome
from Beech Works







From the range of textile finishing machinery manufactured at Beech Works we bring this talented trio into the limelight. The E.G.W. Carboniser (top illustration) incorporates the latest Open Width Acidizer with automatic acid strength control, and 3-stage Drying and Baking Unit. A completely synchronised plant, with comprehensive control panel for one-man operation.

The now well known Mark III E.G.W. Velocitair Tentering Machine (centre) is a multi-layer machine employing nozzle drying, which occupies extremely small floor space, and is suitable for all types of fabrics, from lightweight materials to heavy overcoatings, and even Mohair rugs.

The bottom illustration shows one of the more recent additions to the E.G.W. range— the famous E.G.W.-Vits Universal Stenter, now manufactured under licence at Beech Works. This phenomenal machine incorporates the Vits World Record Drying System for the quick drying, shrinking or setting of fabrics, or for polymerising and processing of resin finishes.

FOR FURTHER DETAILS OF THESE MACHINES PLEASE WRITE TO OUR SALES DEPT.

E. GORDON WHITELEY
LIMITED

BEECH WORKS · MORLEY · YORKSHIRE

Telephone:
Morley 501 and 923
Telegrams and Cables:
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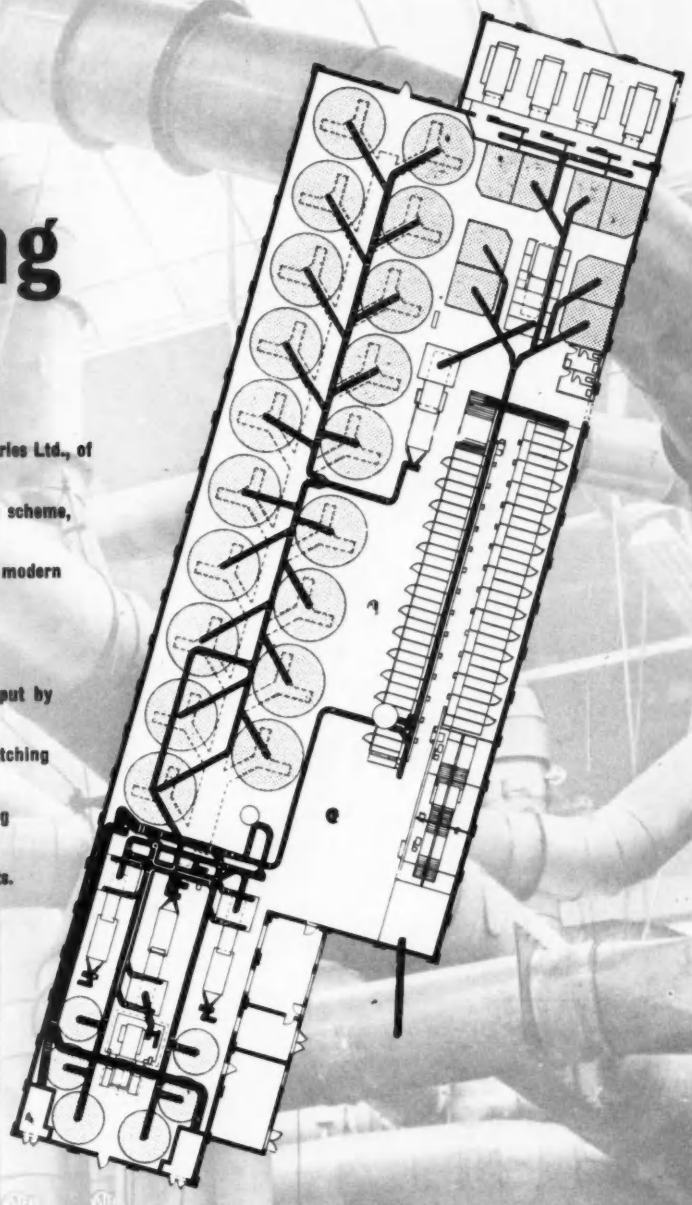
SPENSTEAD

blending plant

was supplied to Messrs. Petmar Industries Ltd., of Batley for their £1 million expansion scheme, making it one of the largest and most modern fibre and carpet plants in Europe.

This new plant greatly increases output by simplifying standardisation and the matching of colour and quality whilst effecting considerable savings in production costs.



SPENSTEAD

the complete system was designed, constructed and installed by

SPENCER & HALSTEAD LIMITED

BRIDGE WORKS OSSETT YORKSHIRE

OSSET 821/4 (4 lines)

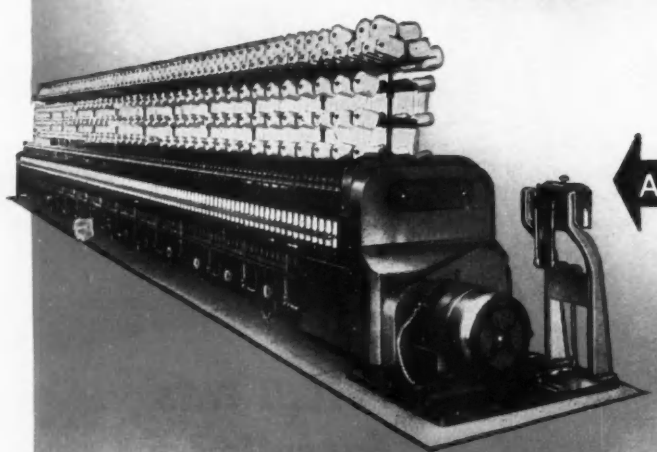
Arunco TEXTILE MACHINERY

ARUNCO CHEESE WINDER

produces perfect cross-wound packages of large size at high speeds.

ARUNCONER HIGH SPEED CONE WINDER

produces the perfect increased taper knitting package.



ARUNCO RING DOUBLING FRAME

for the Twisting of all types of yarn at highest speeds.

Specialists in winding, doubling and gassing machinery, also spindles, rings, etc., for the spinning and doubling trade.

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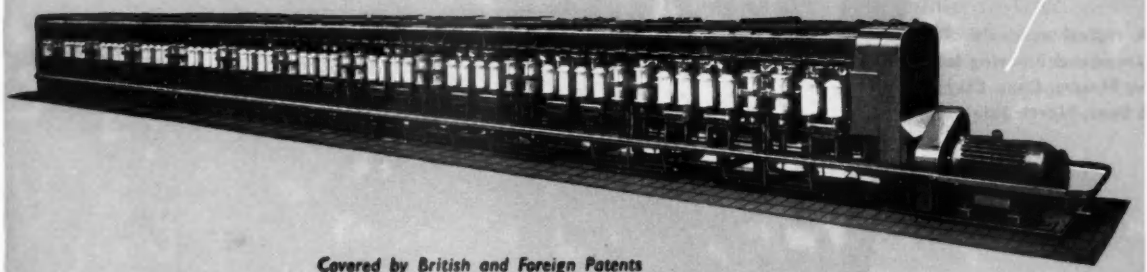
The Aruncorder TYRE CORD MACHINE



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DESIGNED TO PRODUCE RAYON CABLED YARN FROM SPINNERS BOBBINS IN ONE OPERATION

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- SPINDLE SPEED 4,000 R.P.M.
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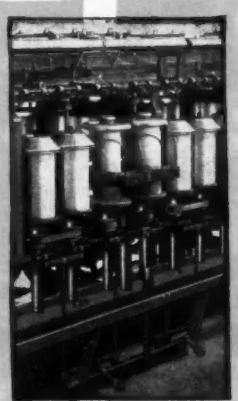

As supplied to the Dunlop Cotton Mills Ltd. and other leading Tyre Cord Manufacturers

DEMONSTRATION FRAME OPERATING IN OUR SHOWROOMS FOR YOUR INSPECTION

ARUNDEL COULTHARD
& COMPANY LIMITED
TEL.: STOCKPORT 3871 ALSO AT PRESTON
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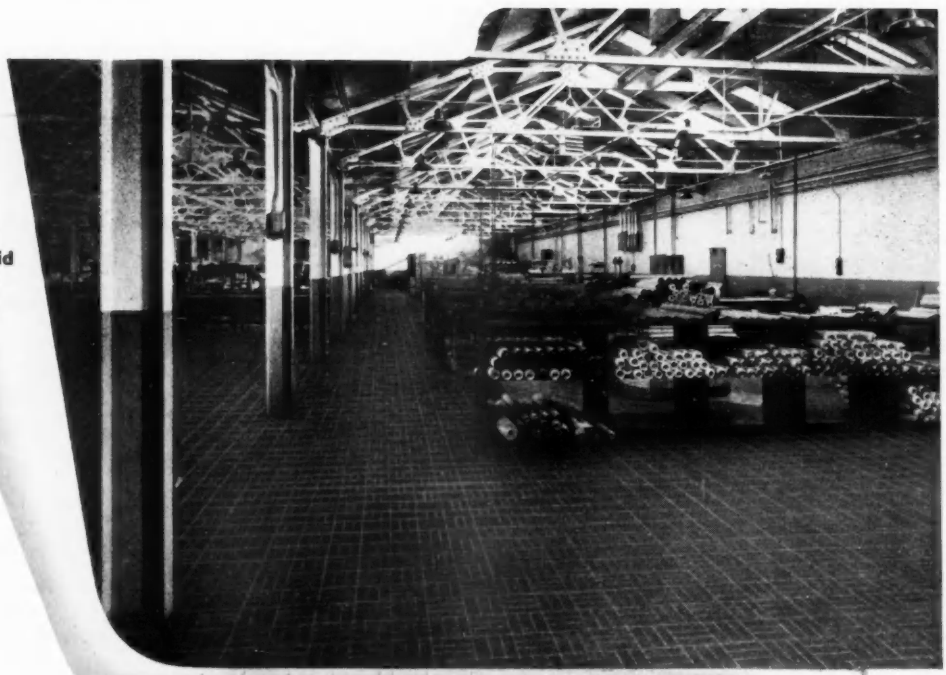
Flooring by Granwood



A typical example of Granwood Flooring laid for Messrs. Chas. Clay & Sons, North Shields

Photograph by kind permission of Chas. Clay & Sons. North Shields,

DUSTLESS
CLEAN AND
HYGIENIC

Granwood Flooring Co. Ltd., is a member of the British Steel Constructions Group of Companies

Please write for illustrated leaflet

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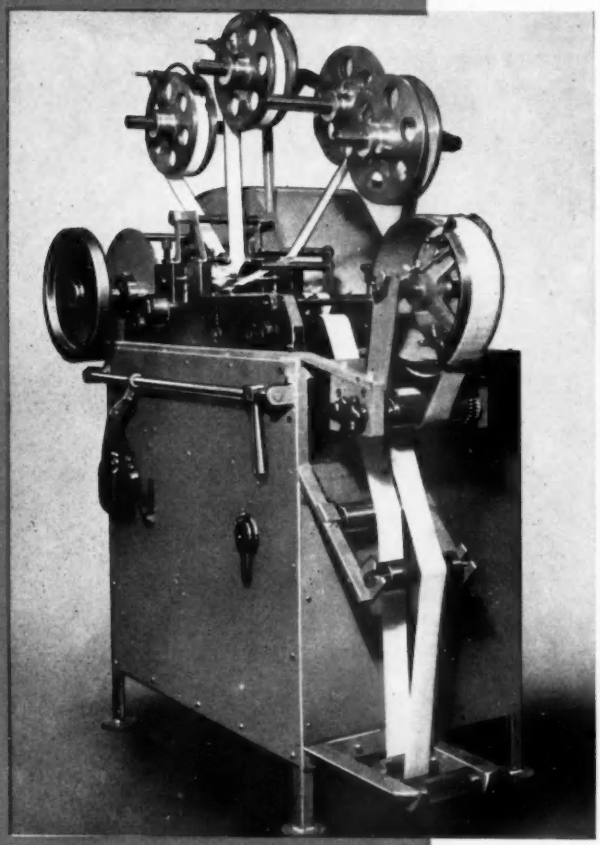
Aiding bandage production



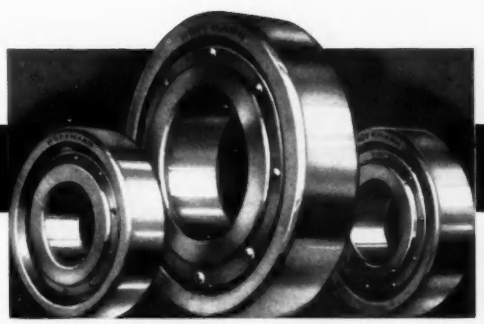
This bandage making machine designed and manufactured by the Textile Engineering Co. Ltd., of Glasgow is readily adjustable for producing waterproof, medicated, adhesive bandage of various widths and lengths at speeds up to 140 pieces a minute.

16 Hoffmann bearings incorporated in this machine minimize friction loss and wear, reduce horse-power requirements, allow increased machine speeds whilst they are grease-sealed thus protecting the work passing over the rollers.

These and other benefits would improve your machinery. Our engineers will be glad to help you with your problems.

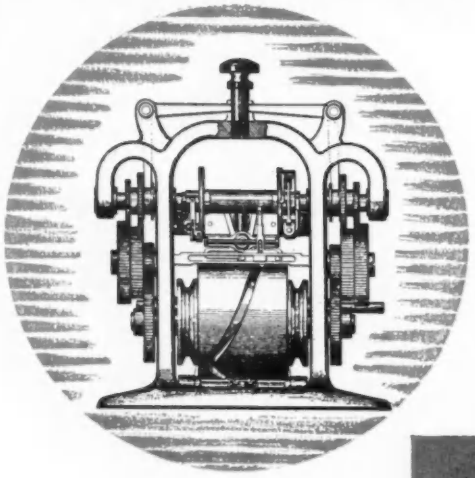
HOFFMANN

BALL & ROLLER BEARINGS



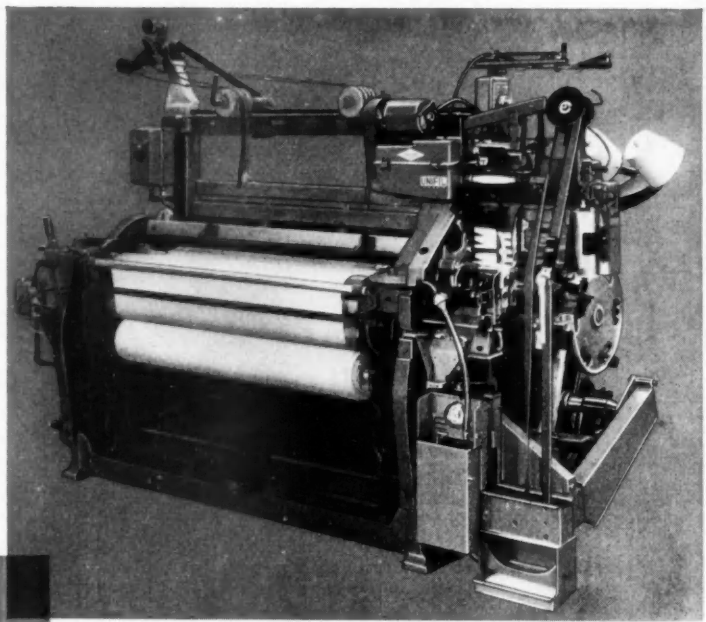
THE HOFFMANN MANUFACTURING CO. LTD.,
CHELMSFORD, ESSEX

ORIGINATORS IN 1891



THE ORIGINAL
PRECISION
WINDING MACHINE

STILL LEADING IN 1958



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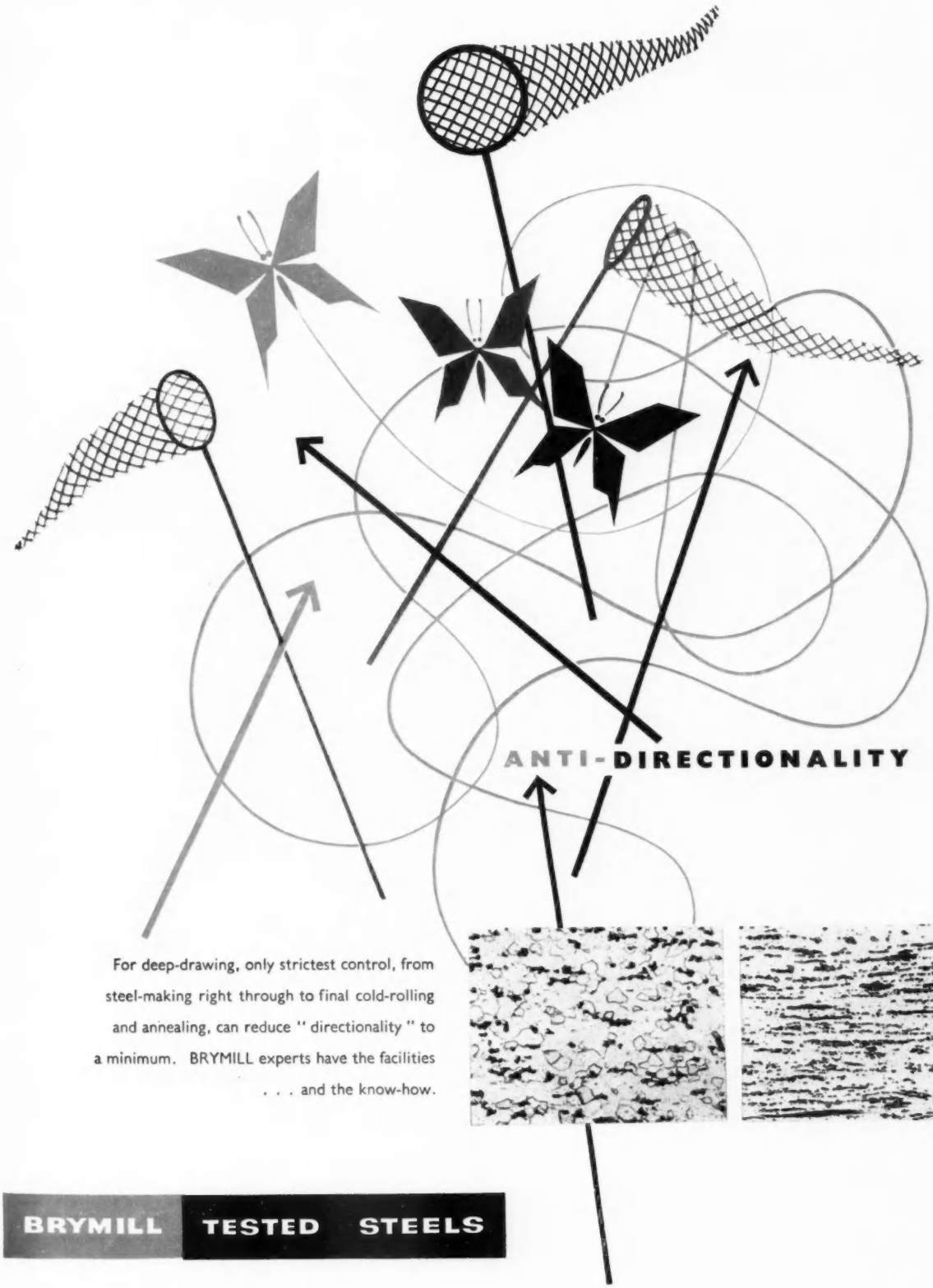
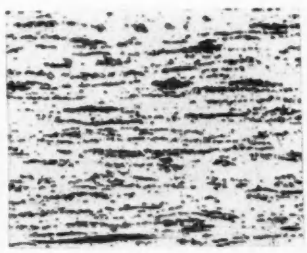


For deep-drawing, only strictest control, from steel-making right through to final cold-rolling and annealing, can reduce " directionality " to a minimum. BRYMILL experts have the facilities . . . and the know-how.



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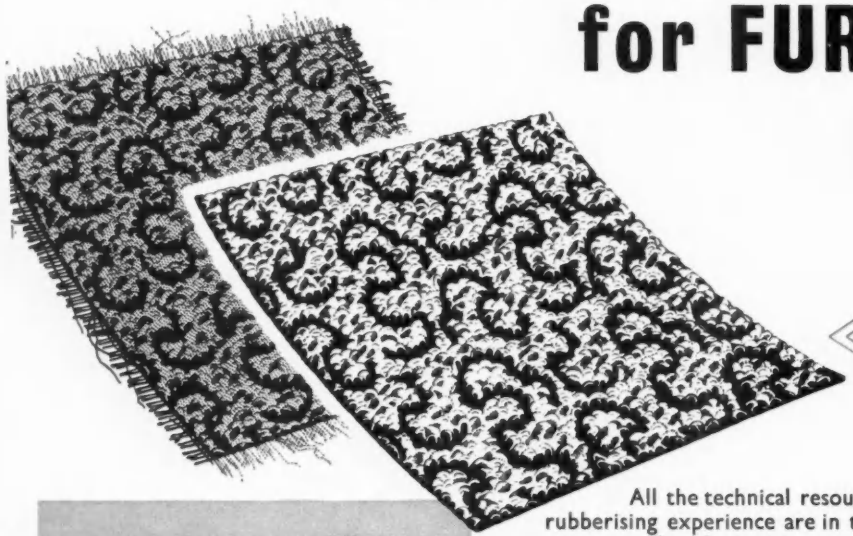

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- ★ Prevents fabric or seam slippage
- ★ Contributes to a satisfactory fabric handle
- ★ Permits decrease in the number of picks used, so saves fibre costs
- ★ Increases weaving production and efficiency

All the technical resource and "know how" of years of rubberising experience are in the Witco method — and great, *very great*, are the advantages possessed by fabrics backed the Witco way. That is why U.S. Fabric Manufacturers and furniture makers have for years been Witco enthusiasts.
Happily, the Witco method is now available to fabric manufacturers throughout Britain, and Witco-backed fabrics are already obtainable from firms using the Witco technique.

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To fabric manufacturers we say — please communicate with us. Enquiries will be treated in confidence, and at the highest level.

To furniture makers we say — insist on Witco backed fabrics. *They're* the winners.

To both we say — Witco does a better, longer lasting and more acceptable job at lower cost. That way lies vastly better trade and more money. So Enquire NOW.

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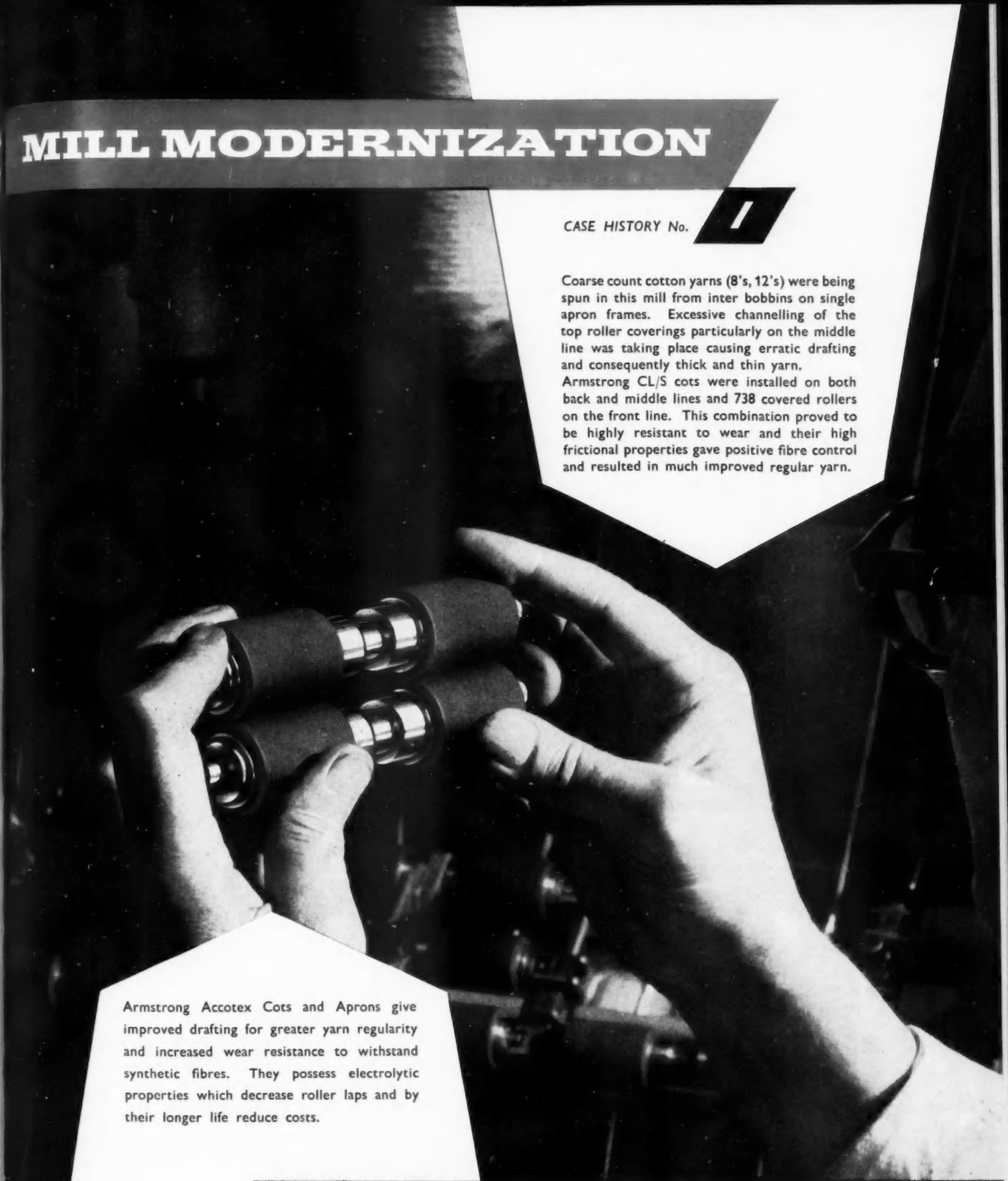
Coarse count cotton yarns (8's, 12's) were being spun in this mill from inter bobbins on single apron frames. Excessive channelling of the top roller coverings particularly on the middle line was taking place causing erratic drafting and consequently thick and thin yarn.
Armstrong CL/S cots were installed on both back and middle lines and 738 covered rollers on the front line. This combination proved to be highly resistant to wear and their high frictional properties gave positive fibre control and resulted in much improved regular yarn.



Armstrong Accotex Cots and Aprons give improved drafting for greater yarn regularity and increased wear resistance to withstand synthetic fibres. They possess electrolytic properties which decrease roller laps and by their longer life reduce costs.

Armstrong ACCOTEX* COTS & APRONS

For full details write to :—

ARMSTRONG CORK COMPANY LTD., 210-213 ROYAL EXCHANGE, MANCHESTER 2. Telephone: DEAnsgate 7311/2 and 8078. And at 24 Humboldt Street, Bradford and 5 Oswald Street, Glasgow, C.1. Regd. Office: Kingsbury, London, N.W.9. Factories: OLDHAM and GATESHEAD-ON-TYNE.

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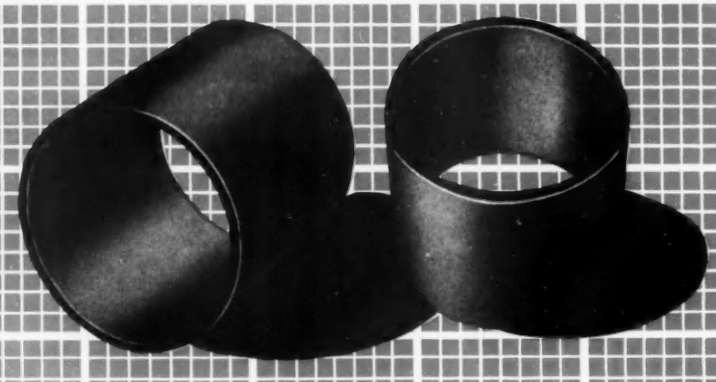

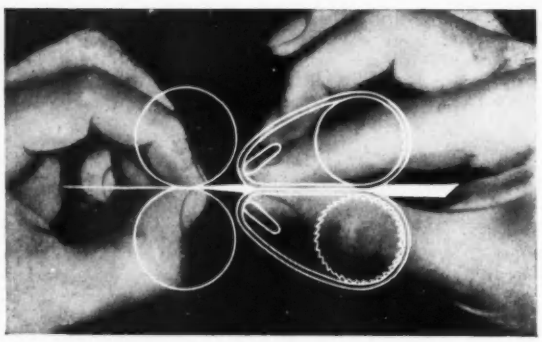

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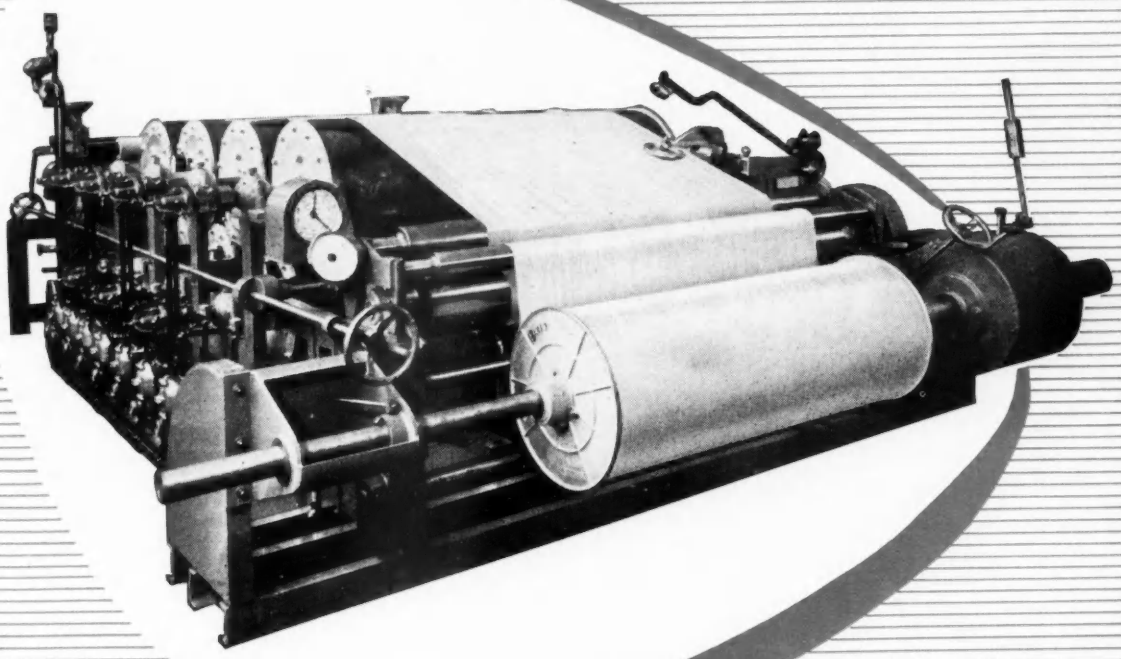
All Yarns

MULTI-CYLINDER WARP SIZING MACHINE



The ALL YARNS Multi-Cylinder Warp Sizing Machine enhances the reputation for versatility which Holt machines have gained throughout almost a hundred years of constant improvements in design and performance.
We invite you to write now for fully descriptive literature on this and other Holt machines, and we will gladly arrange demonstrations by appointment.

- This machine is suitable for all synthetic yarns, including acetate and viscose rayon, nylon and "Terylene."
- It can also size on a quality basis rayon staple, linen, flax, jute and high twist single or double cotton yarns.
- Five, seven or nine cylinders can be used, depending on the amount of moisture to be evaporated from the yarn.
- The machine can be supplied with a beam-to-beam creel for filament yarns, with multi-beam inclined creel and hook reed leasing system for sizing filament yarn on the cotton system, or a double-tier beam creel for spun yarns.
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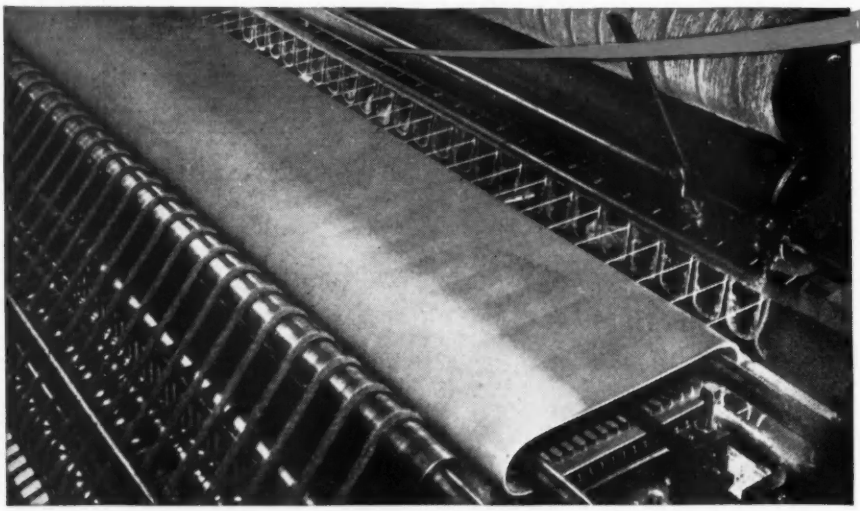

Andre Condenser Rubbers in a well-known Yorkshire mill. In use for more than 5 years, the rubbers are still working with unimpaired efficiency. Leading manufacturers throughout the world are obtaining similar service from Andre Rubbers.

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- **HIGHER PRODUCTION**
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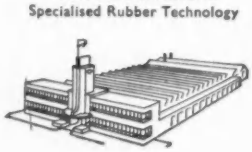

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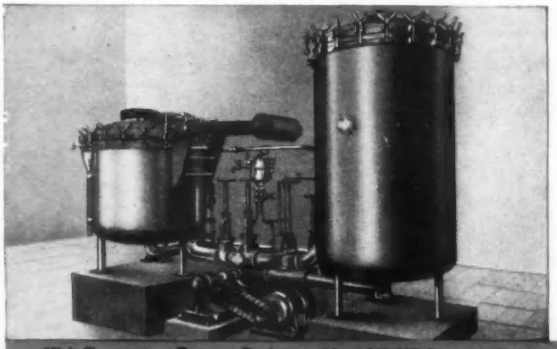
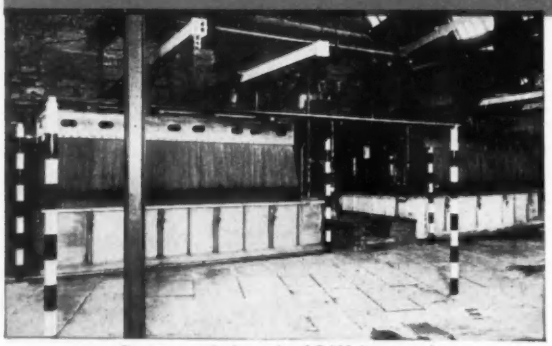
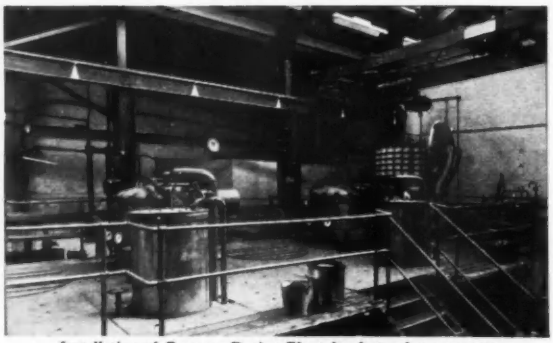


High Temperature Pressure Dyeing machine—250/300 lbs. capacity.

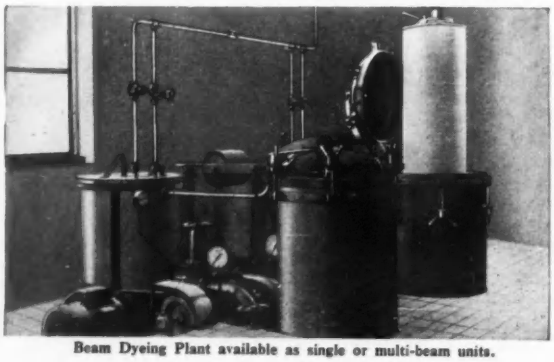
LONGCLOSE YARN DYEING PLANT



Carpet yarn dyeing unit—4/5,000 lbs. capacity.



Installation of Pressure Dyeing Plant for fast colours on cotton cheeses, cones and hanks.



Beam Dyeing Plant available as single or multi-beam units.

Whatever type of yarn has to be dyed there is a Longclose machine to do the job.

Longclose Hank Dyeing Machines for carpet yarn, hand knitting yarns and hosiery yarns are available with capacities from 5-9,000 lbs. per batch. The Longclose Pressure System dyes cheeses, cones, Viscose Rayon Cakes, warps and hanks with batch capacities 1-1,000 lbs. Plant suitable for all types of spun and continuous filament yarns supplied, including machines allowing use of temperatures exceeding 130° C. Standard beam dyeing units for one, three or four beams—with pre and after treatment plant. Specialised plant for Viscose Rayon Cake Dyeing.

Let Longclose place their more than forty years' experience of yarn dyeing in all its forms at your service —Write for full details of plant to suit your needs—and increase your dyeing efficiency.

LONGCLOSE ENGINEERING Co. LTD.

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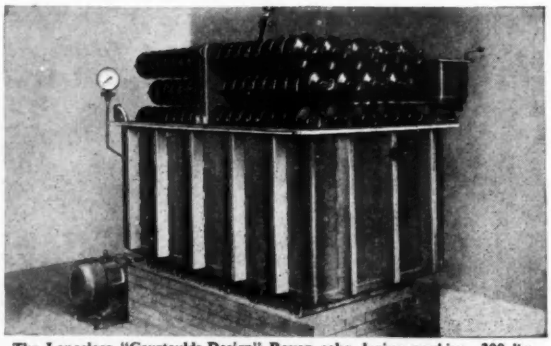
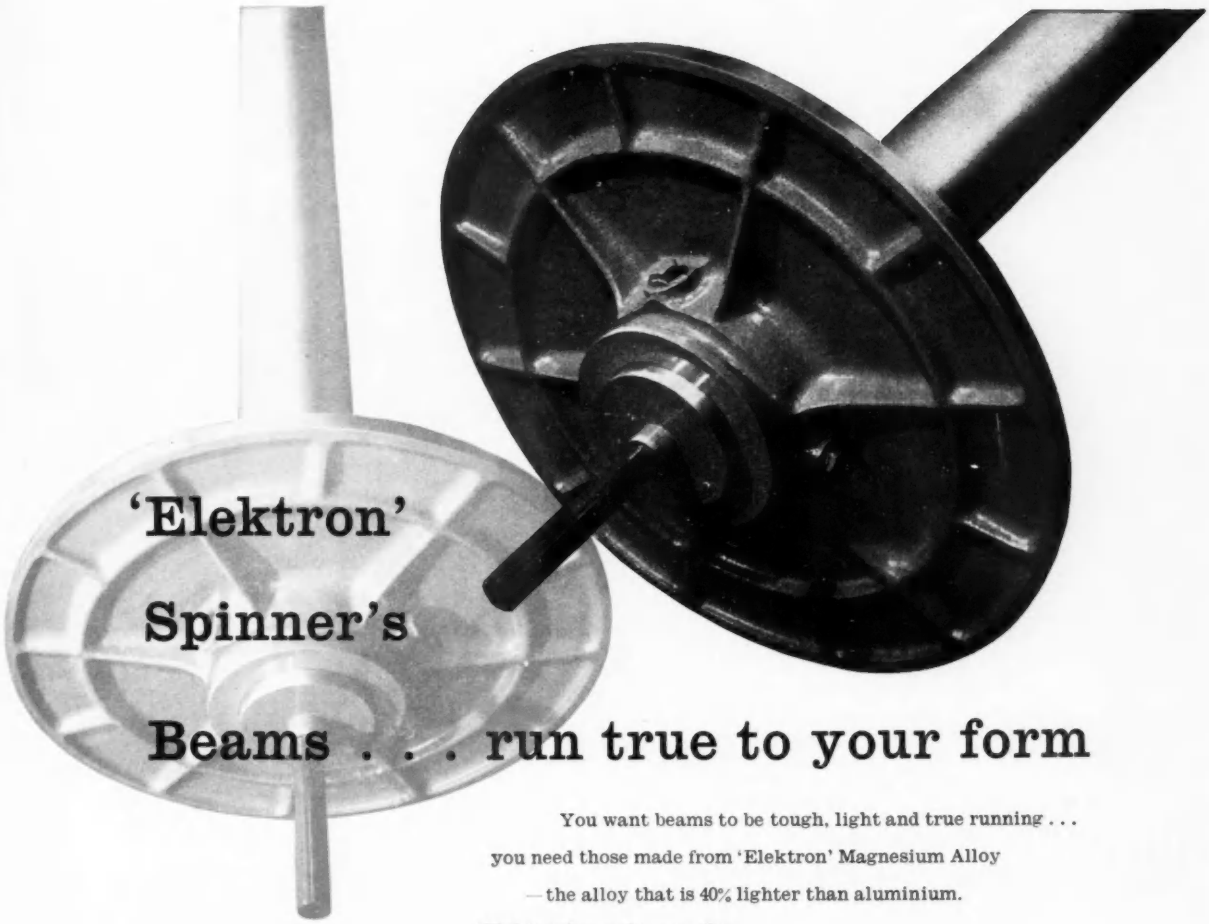


The Longclose "Courtaulds-Design" Rayon cake dyeing machine—300 lbs. capacity unit.



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You want beams to be tough, light and true running . . .
you need those made from 'Elektron' Magnesium Alloy
— the alloy that is 40% lighter than aluminium.

'Elektron' warp beams offer—

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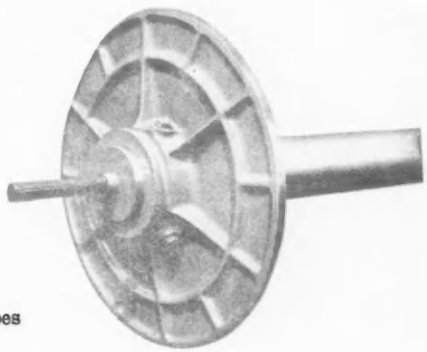
* robustness — beams withstand repeated transport over land and sea
* semi-circular groove machined in rear of flange hubs for rope brake
* ease of handling



For full information about 'Elektron' beams of all types
write or 'phone — **Magnesium Elektron Limited,**
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* Yarn produced on Tico covered rollers stands up to expert examination. *(Photo by courtesy of Rugby Mill Ltd., Chadderton)*

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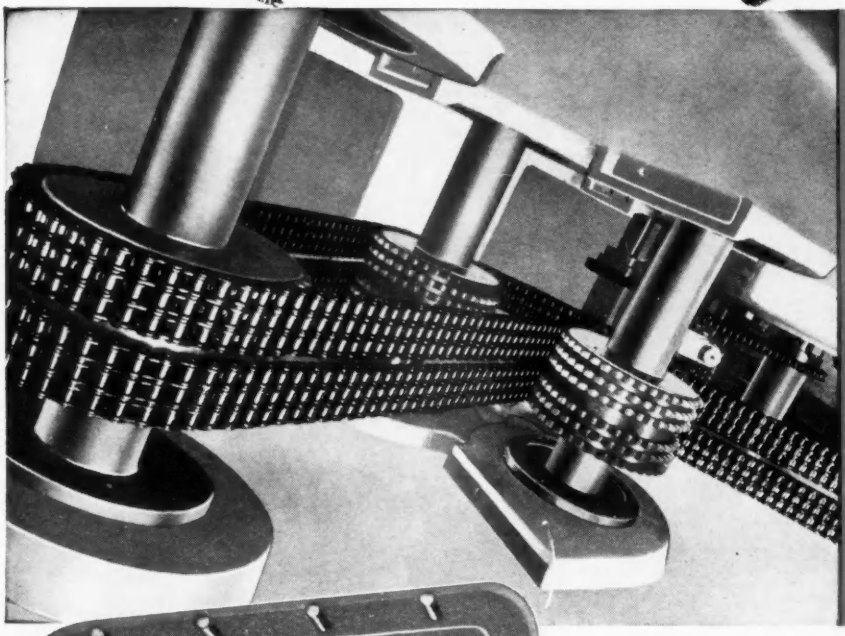
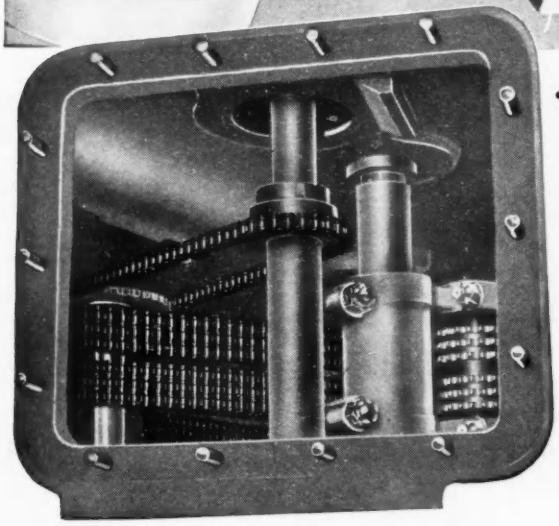
—BRITISH NYLON SPINNERS DO!



These photographs illustrate Perry multi-strand chain drives as used extensively by British Nylon Spinners Limited. For long and *consistently* reliable service it pays to specify Perry. Let our technicians help to solve *your* chain drive problem. Your enquiry will be given immediate and expert attention.



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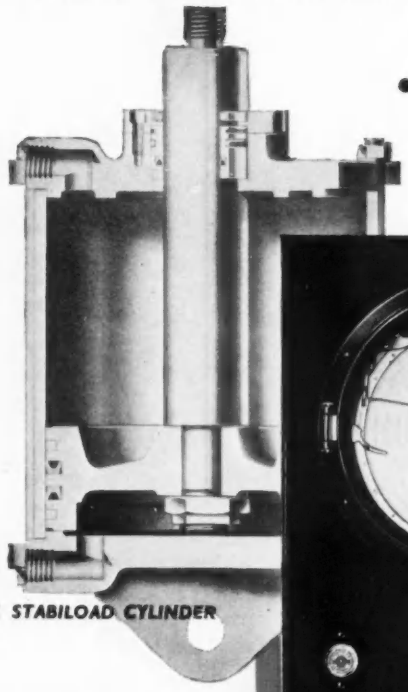
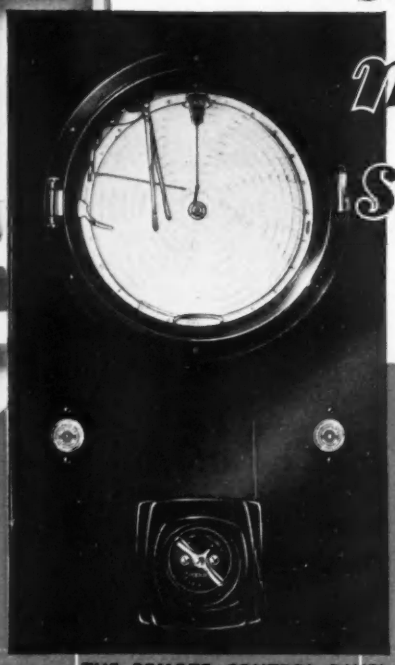


THE STABILOAD CYLINDER



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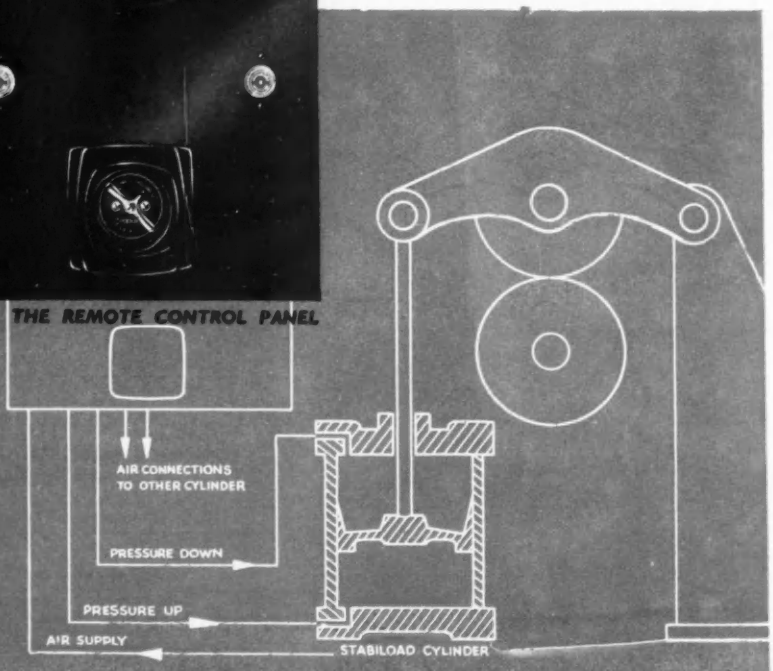

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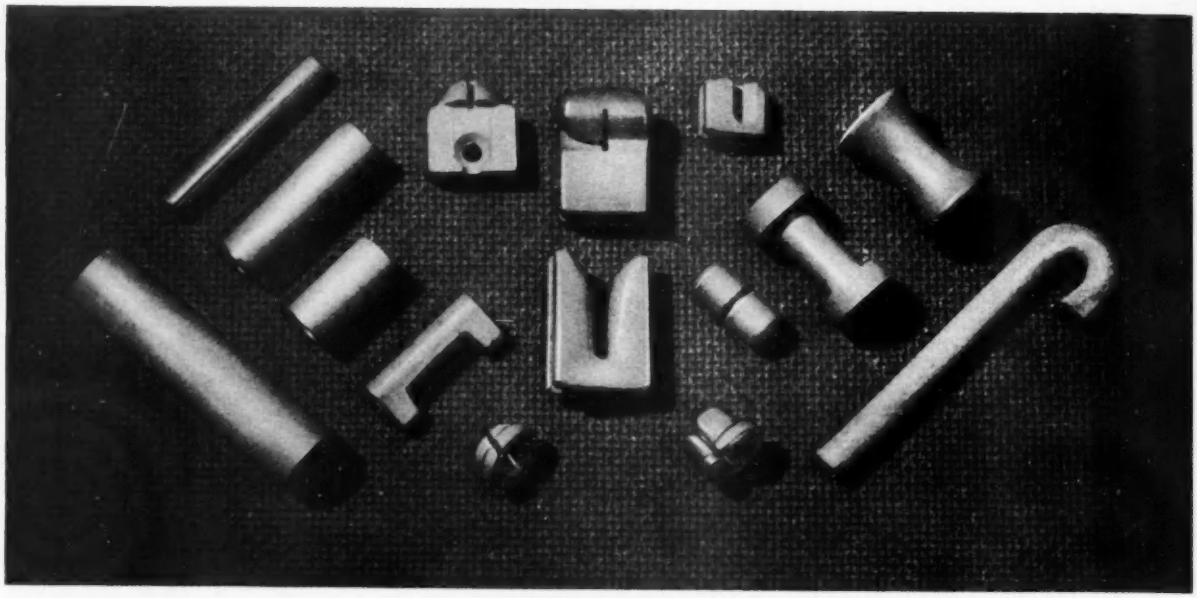

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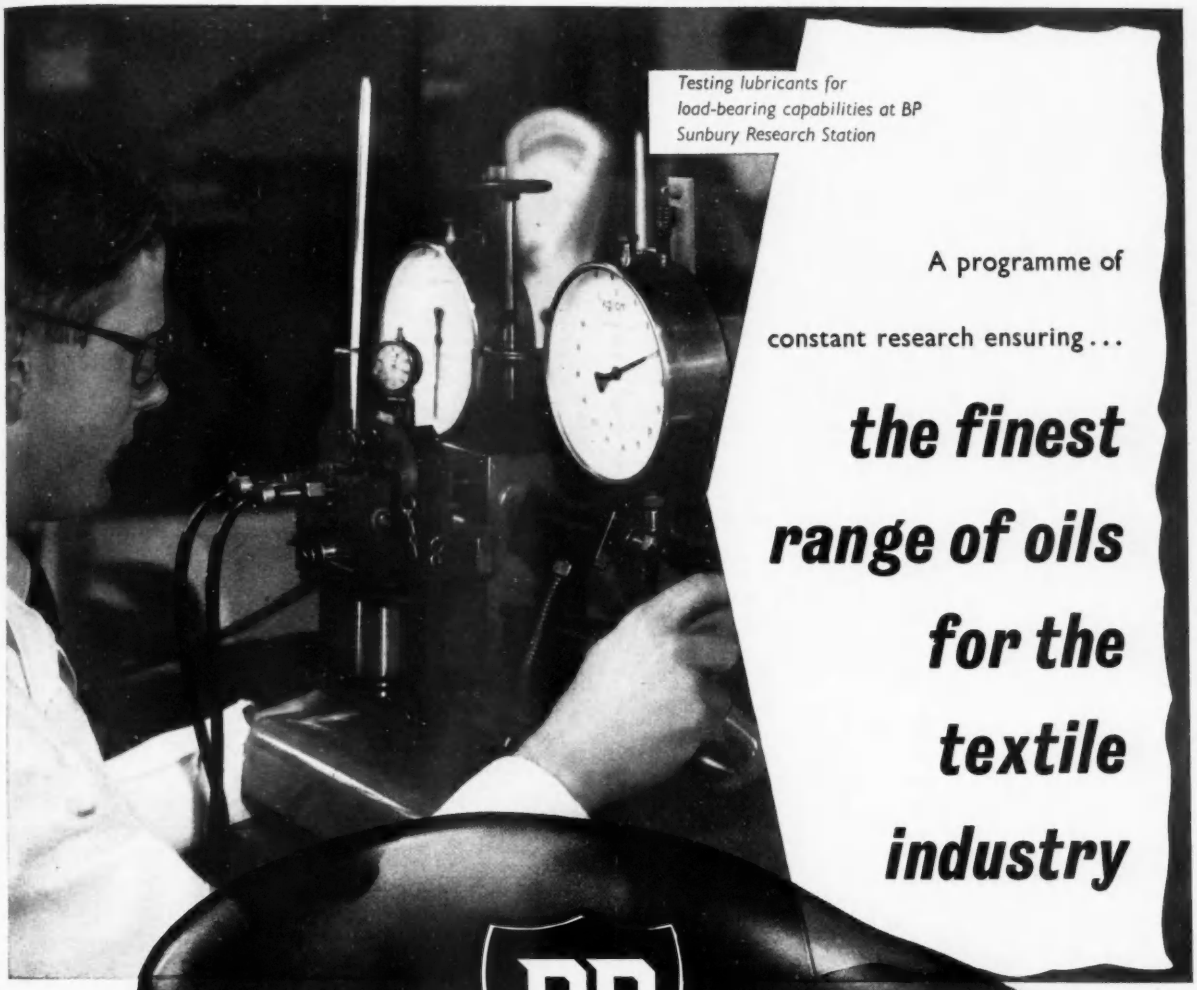

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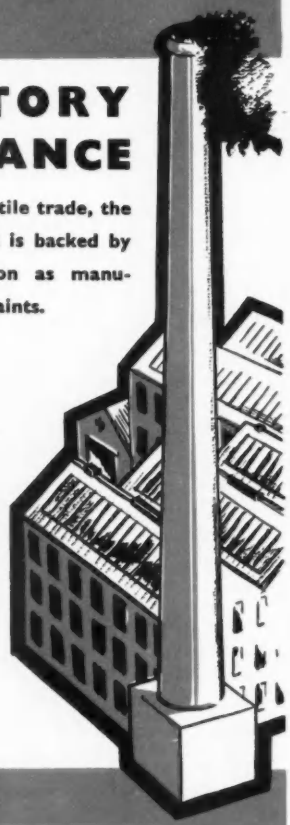

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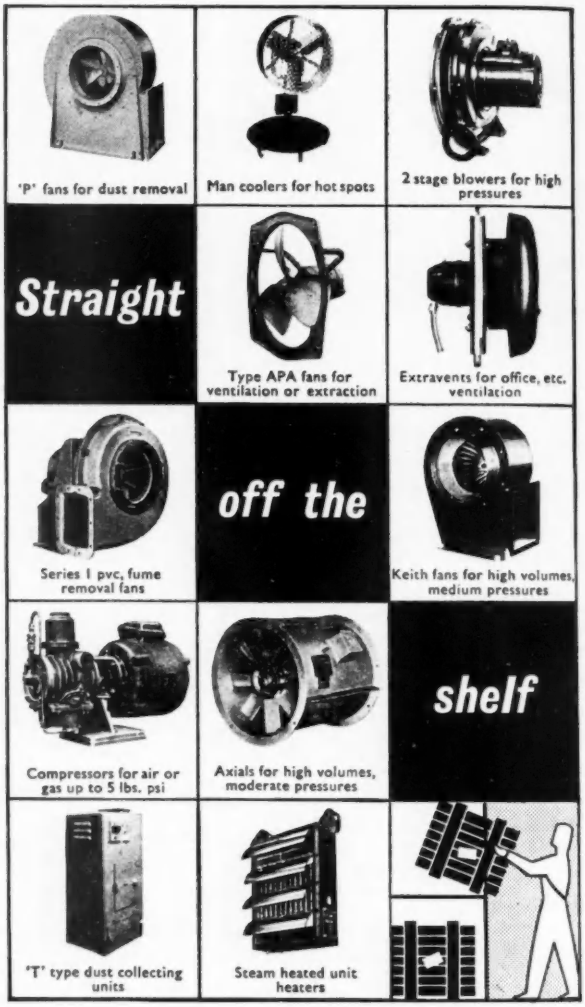
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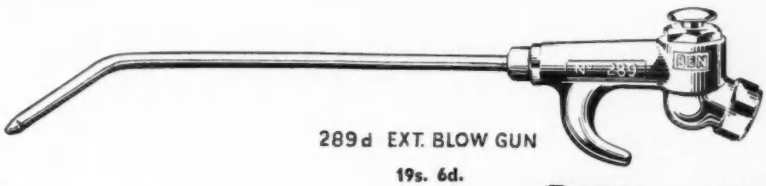

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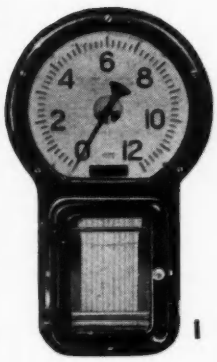

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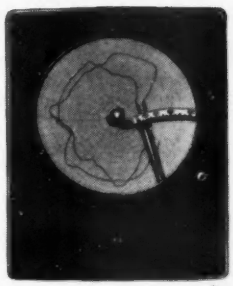
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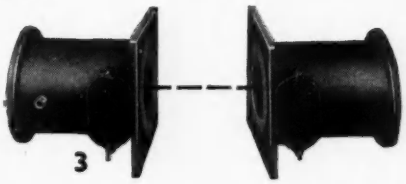
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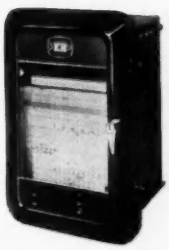
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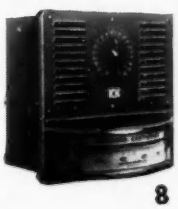
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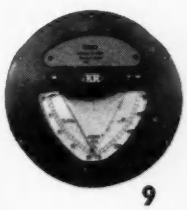
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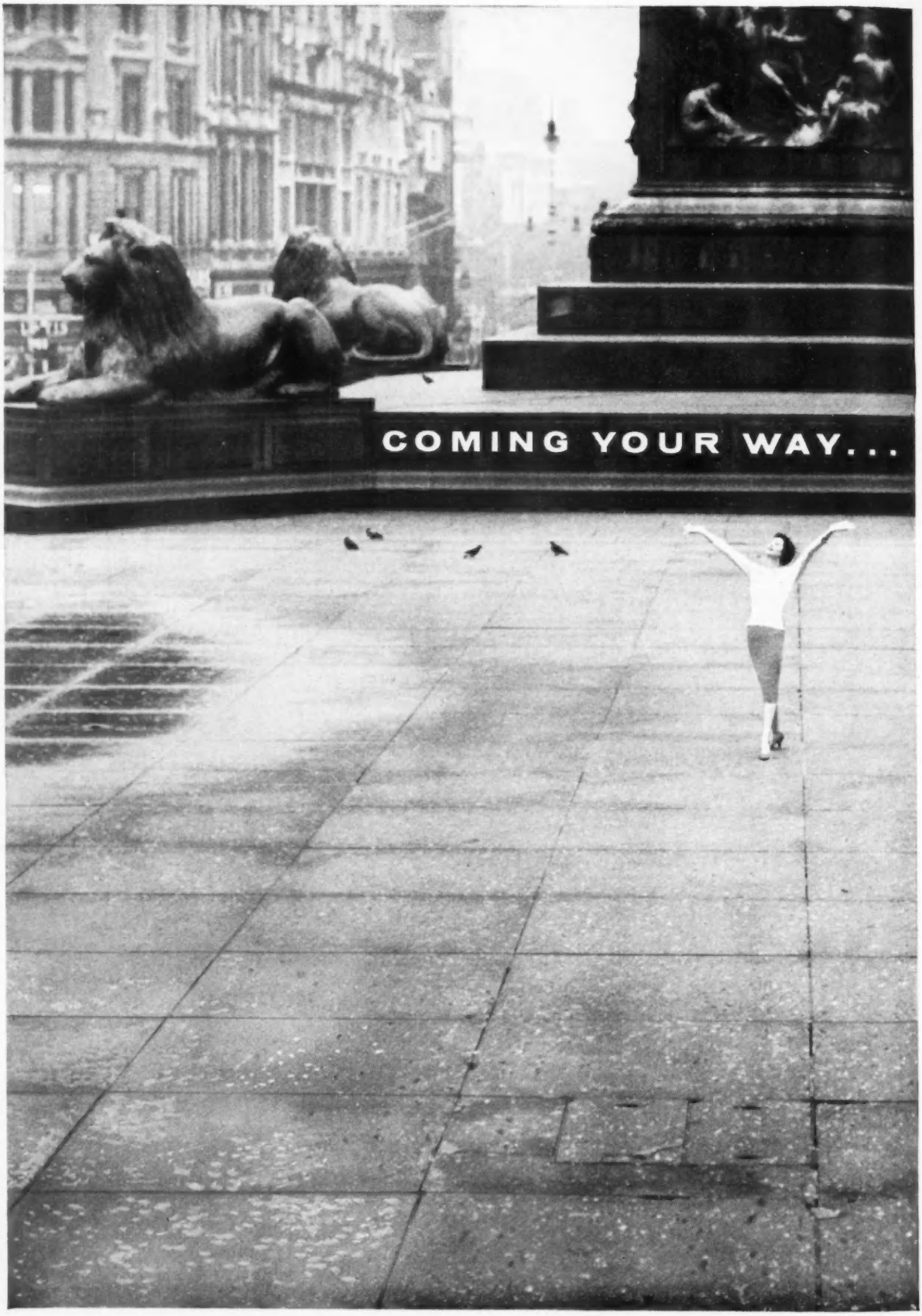
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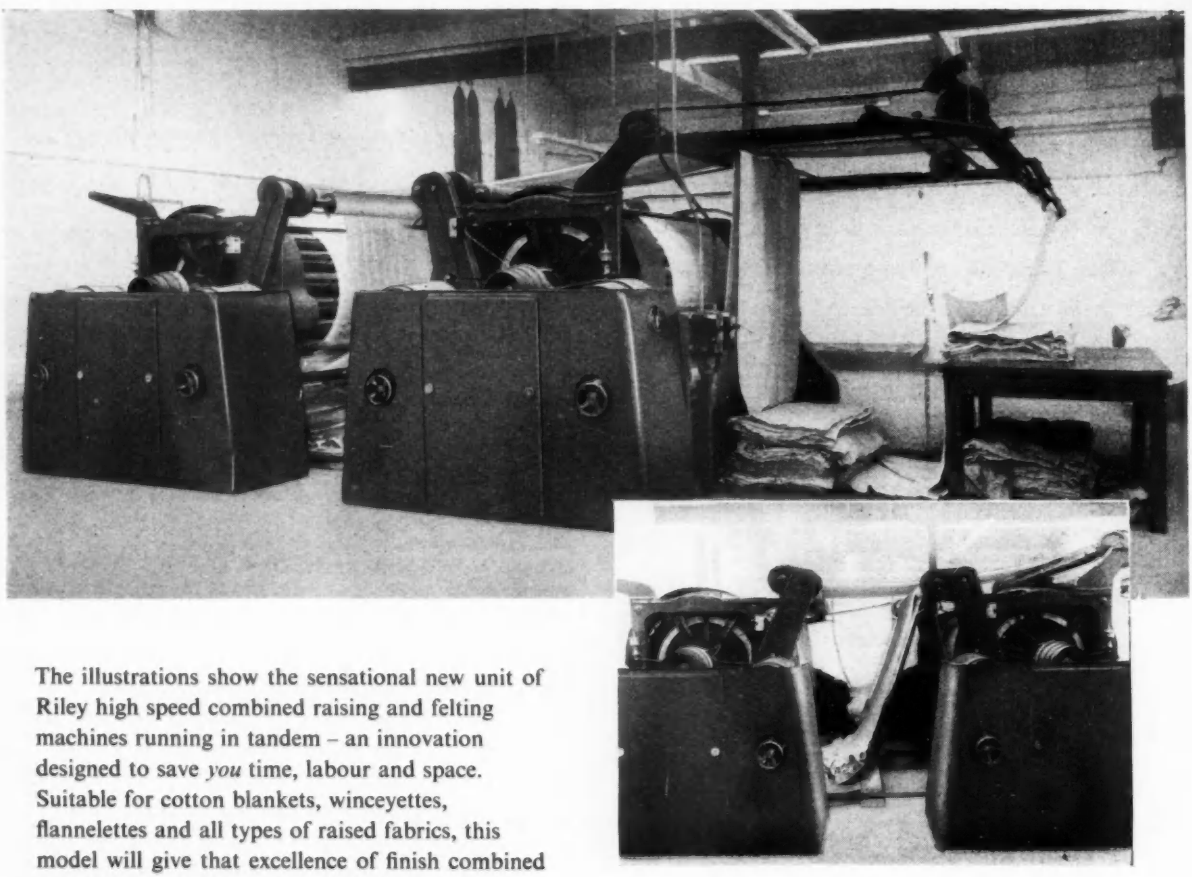
Now a *Riley* combined high speed RAISING & FELTING machine to save you :-

Time • Labour • Space



The illustrations show the sensational new unit of Riley high speed combined raising and felting machines running in tandem – an innovation designed to save *you* time, labour and space. Suitable for cotton blankets, winceyettes, flannelettes and all types of raised fabrics, this model will give that excellence of finish combined with high production which is the hallmark of all Riley machines.

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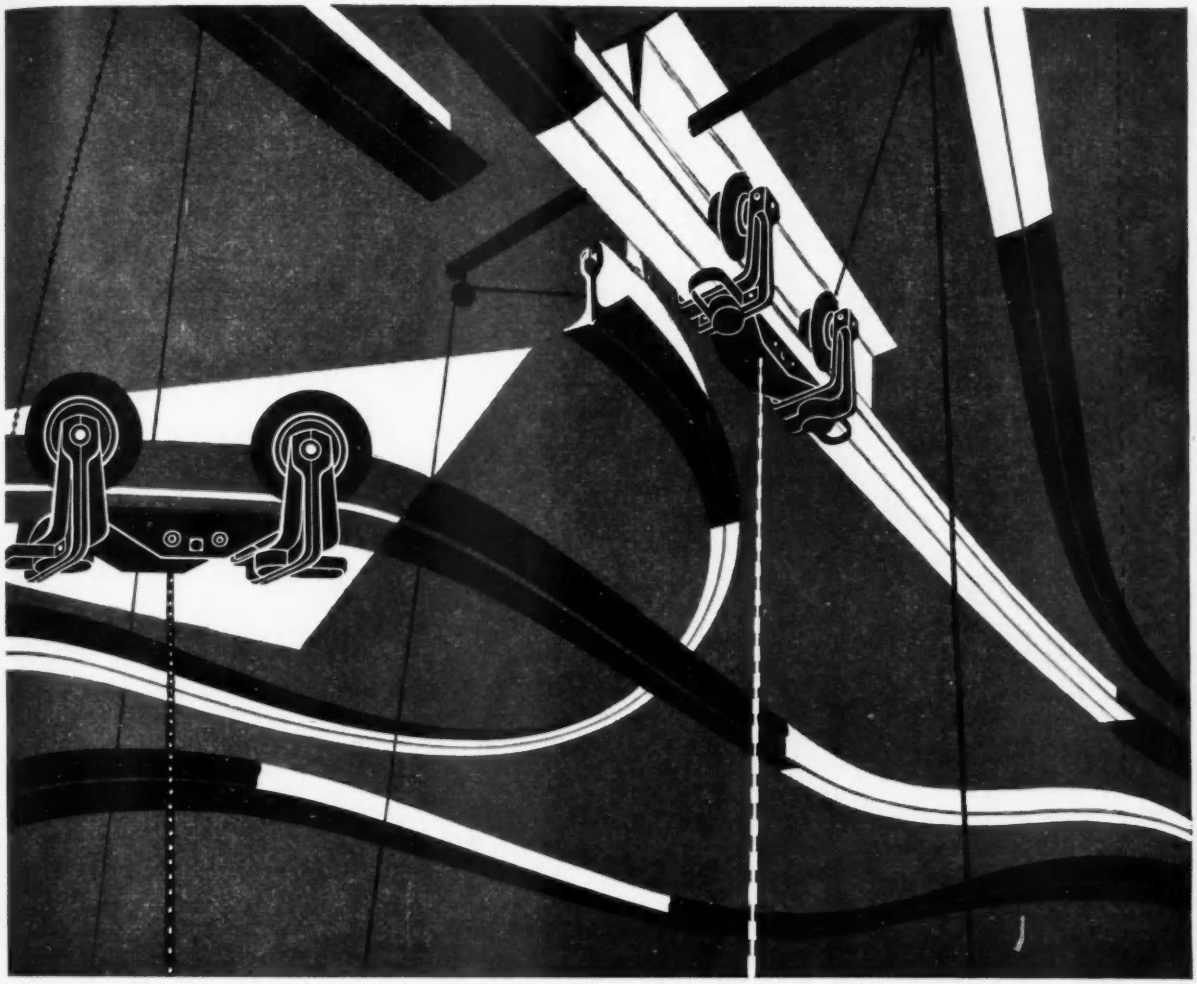

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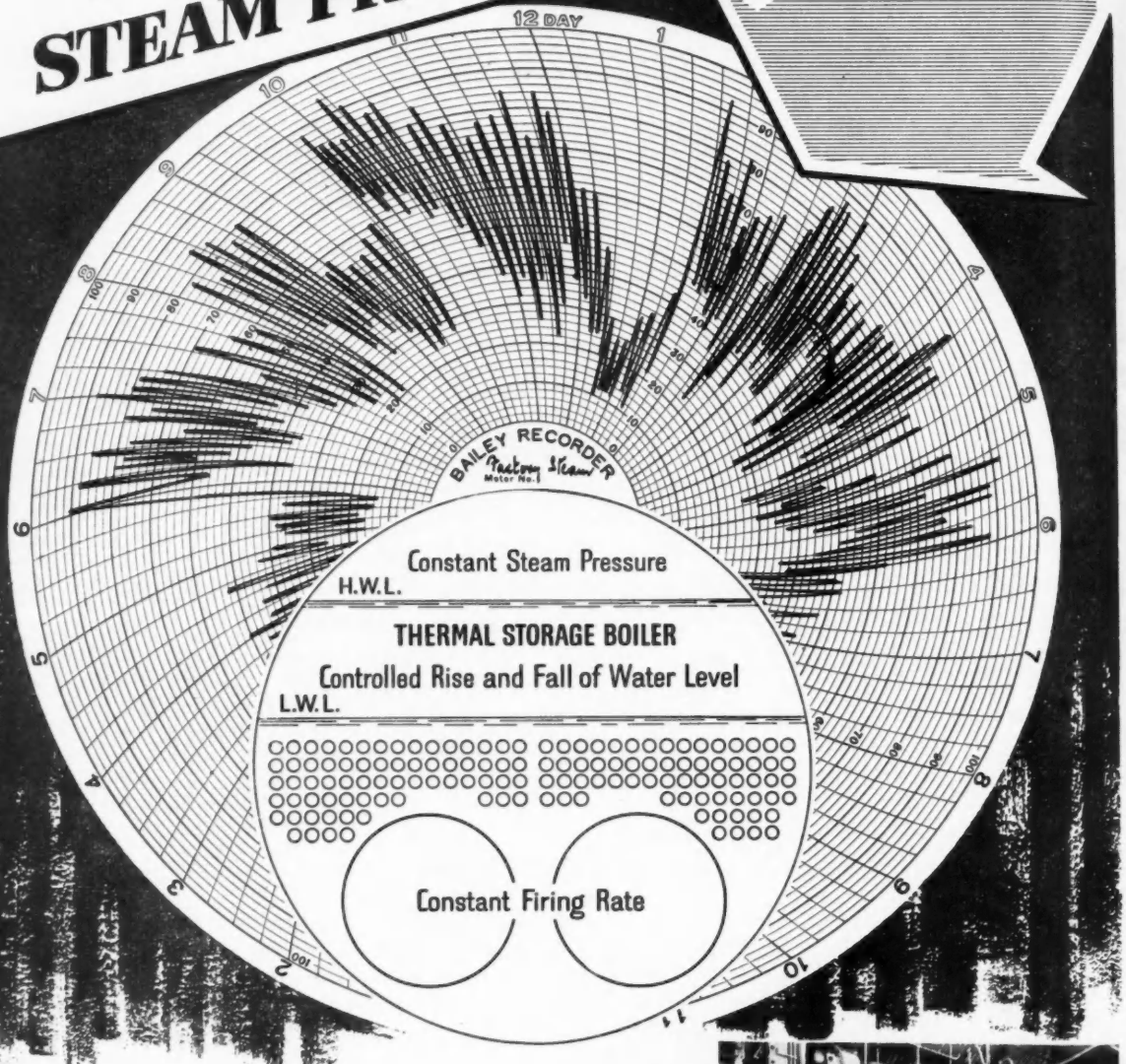

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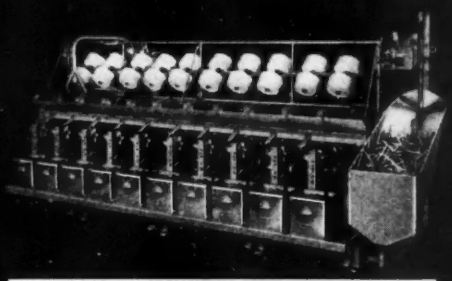

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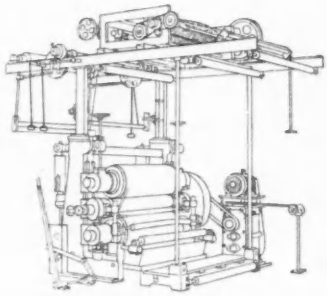
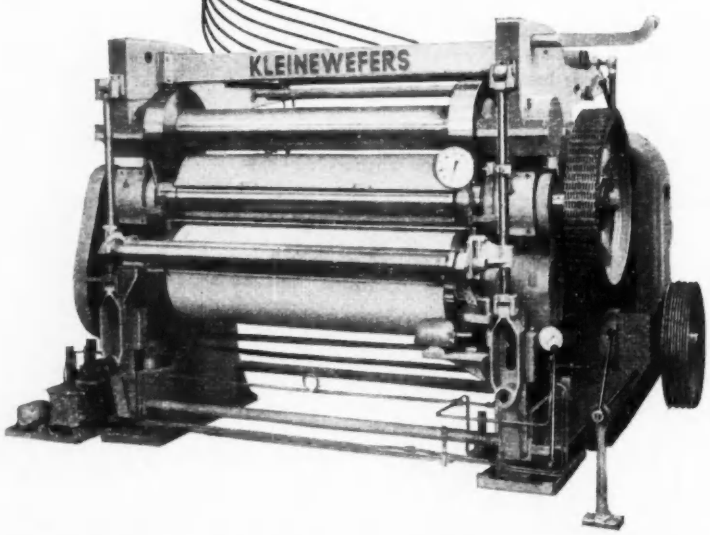


Water Mangle in a Bleaching Plant



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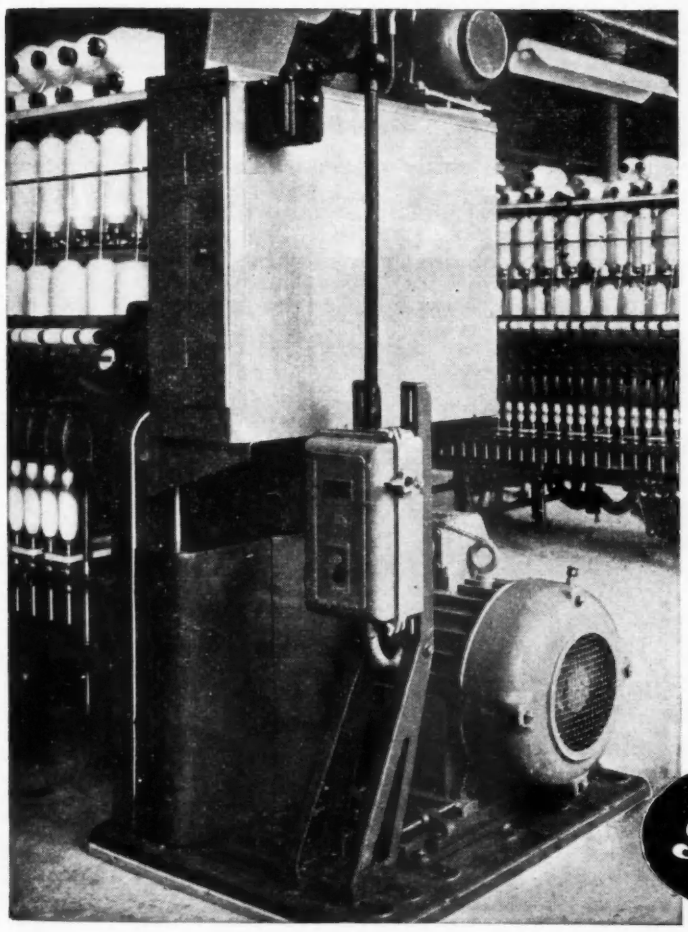

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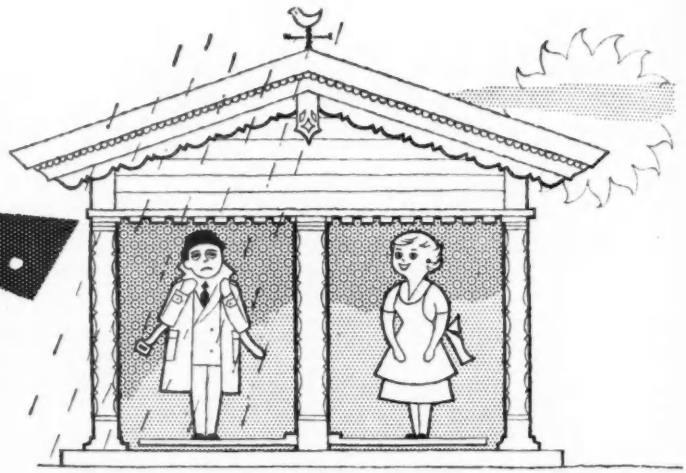

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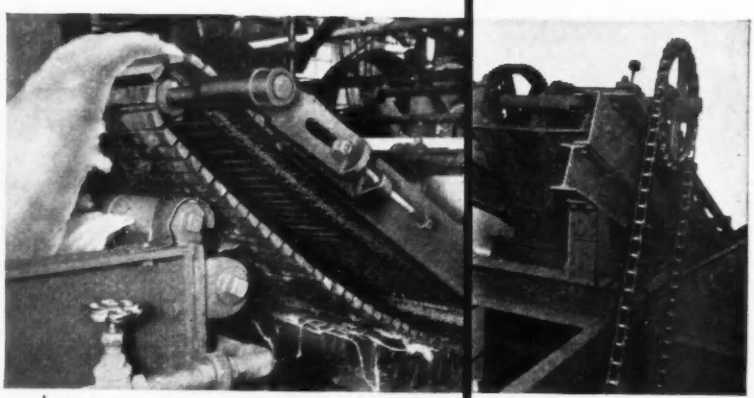
steel roller chains as a replacement for malleable chains on slow speed drives and light conveyors on all kinds of machinery and plant where operating conditions are bad and the chains are not enclosed.

Write for Catalogue Ref. 116/101 for full details, dimensions and prices.



In continuous contact with wool saturated in cleaning fluid, containing waste from previous washings, The Coventry Mark 5 chain on this wash-bowl carrier is still giving trouble-free service after over three years' continuous service.

Working without lubrication and covered in coke dust, the Coventry Mark 5 chain on this conveyer headstock drive continually handles 90 tons of coke per day.

★ **runs easier**

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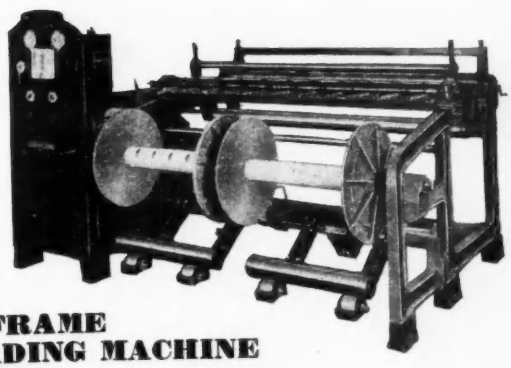
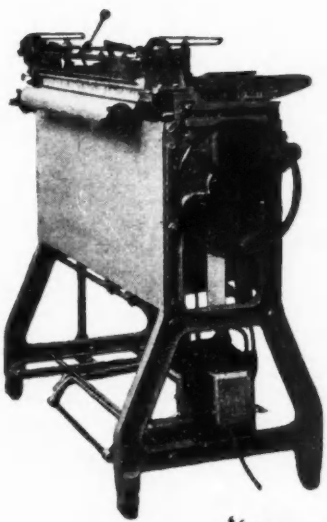
Lockheed Hydraulics enable constant pressure to be applied to beam rollers, from nothing to 1,000 lbs. per square inch, each side controlled independently. Constant Peripheral Beaming Speed throughout entire range of beam, from 6" diam. barrel to 36" diam. flange, at three different speeds. Totally enclosed oil immersed Constant Speed H-Gear Unit. Warp Length guaranteed. Machine automatically cuts out at any pre-set yardage for any number of beams, until re-set

Tube frame threaded with the spool in its spring holders; eliminates four operations (patents pending). Needles are brought forward by simple foot operated switch, leaving operatives' hands free to attend to interrupted ends and return to thread by the same operation. Tube frames can be threaded as fast as removed from the chain, th s facilitating immediate return to their last position in the chain. All needles have rounded crochet hook ends, preventing yarn damage and enabling smoother threading. All spool end strive difficulties overcome, enabling 100% threading even if strive is as much as 1" by our new full length comb. By fitting side supports the standard 4/4 machine can thread 2/4 to 16/4 Tube frames, or a machine can be supplied 12/4 in width. Tube Frame automatically clamped eliminating still a further hand operation.





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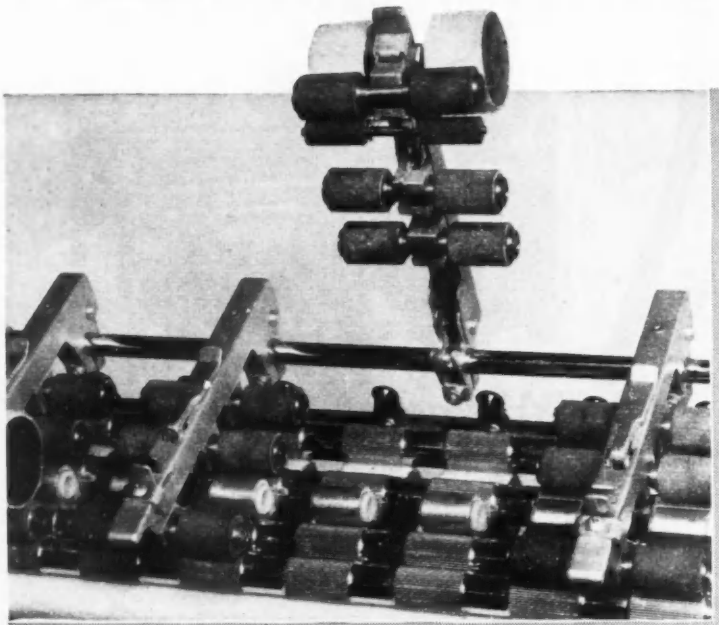
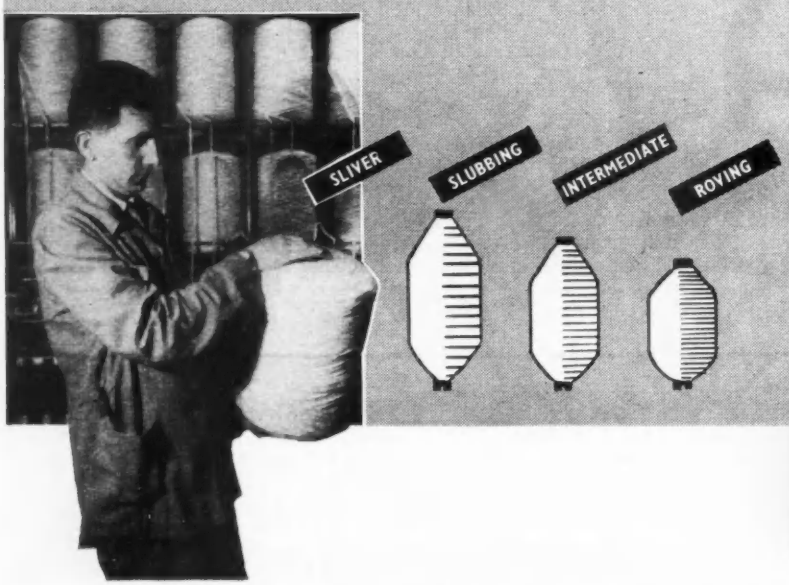
for FINE - MEDIUM and COARSE counts



A certain method of improving yarn quality from . . .



The Balmes New Drafting System is entirely without aprons— clean, easy to handle and simple to maintain

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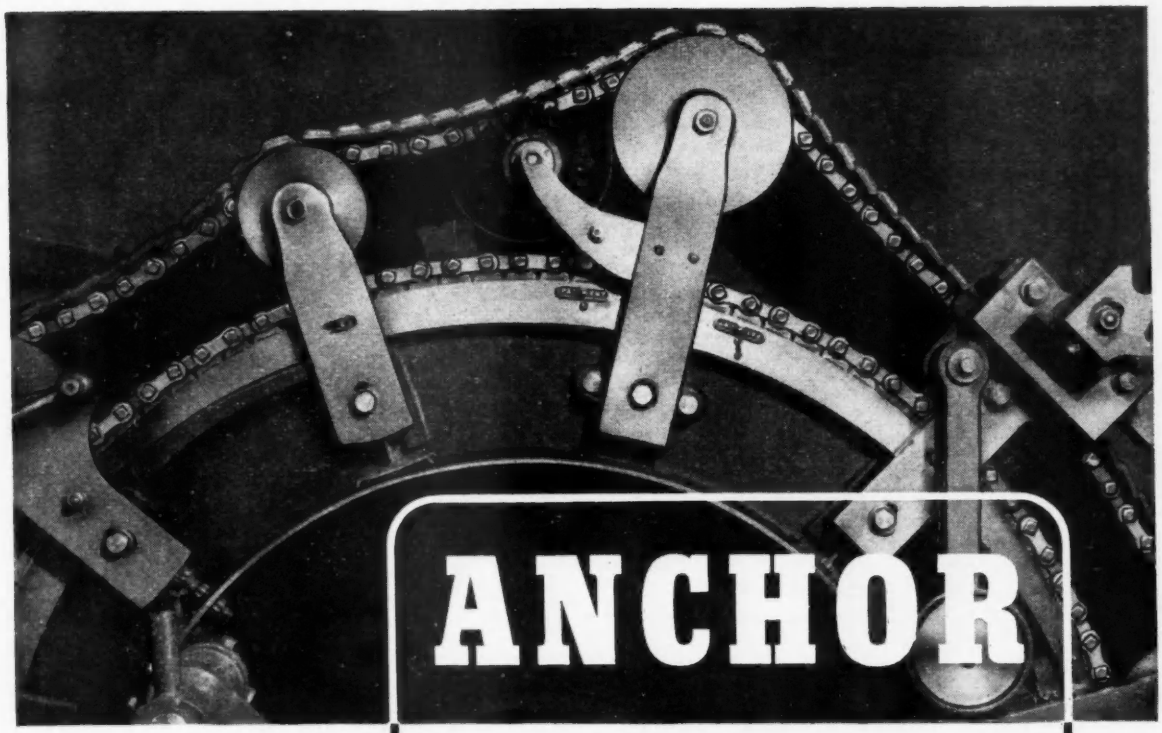

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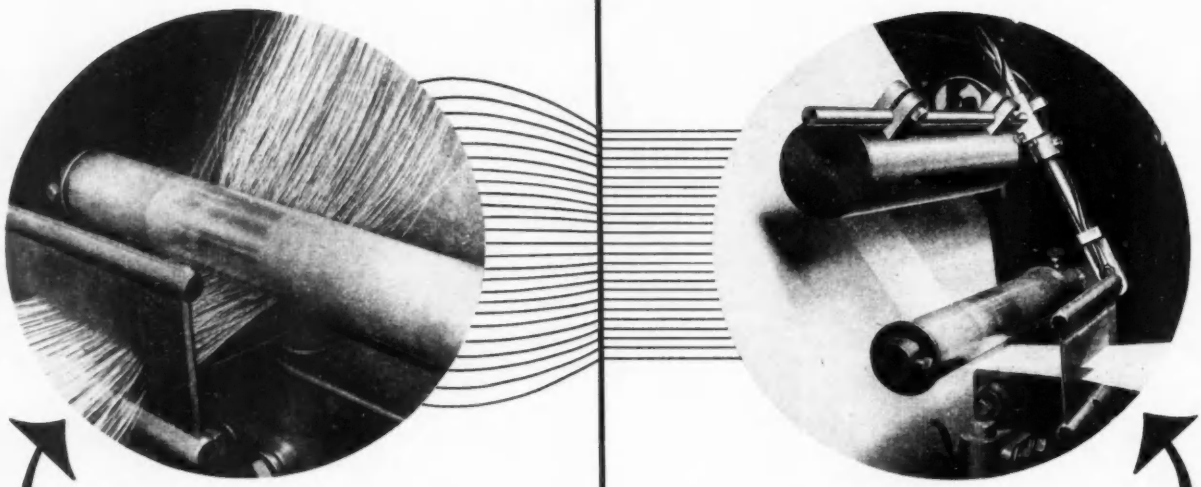

This problem

The above illustration shows the effects of static charges on synthetic fibres. Threads are trapped and broken, causing frequent stoppage and wastage.

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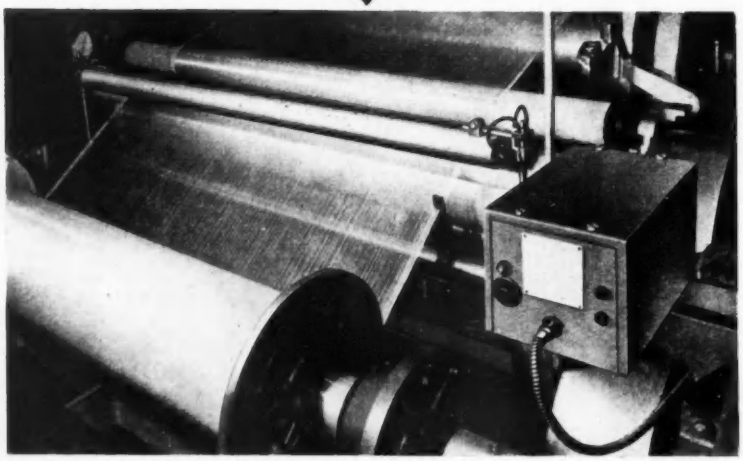
With the "Shirley" Static Eliminator in operation the yarn runs true and parallel under all conditions. Suitable for warping, sizing, carding, stentering etc. Send for folder N/a.



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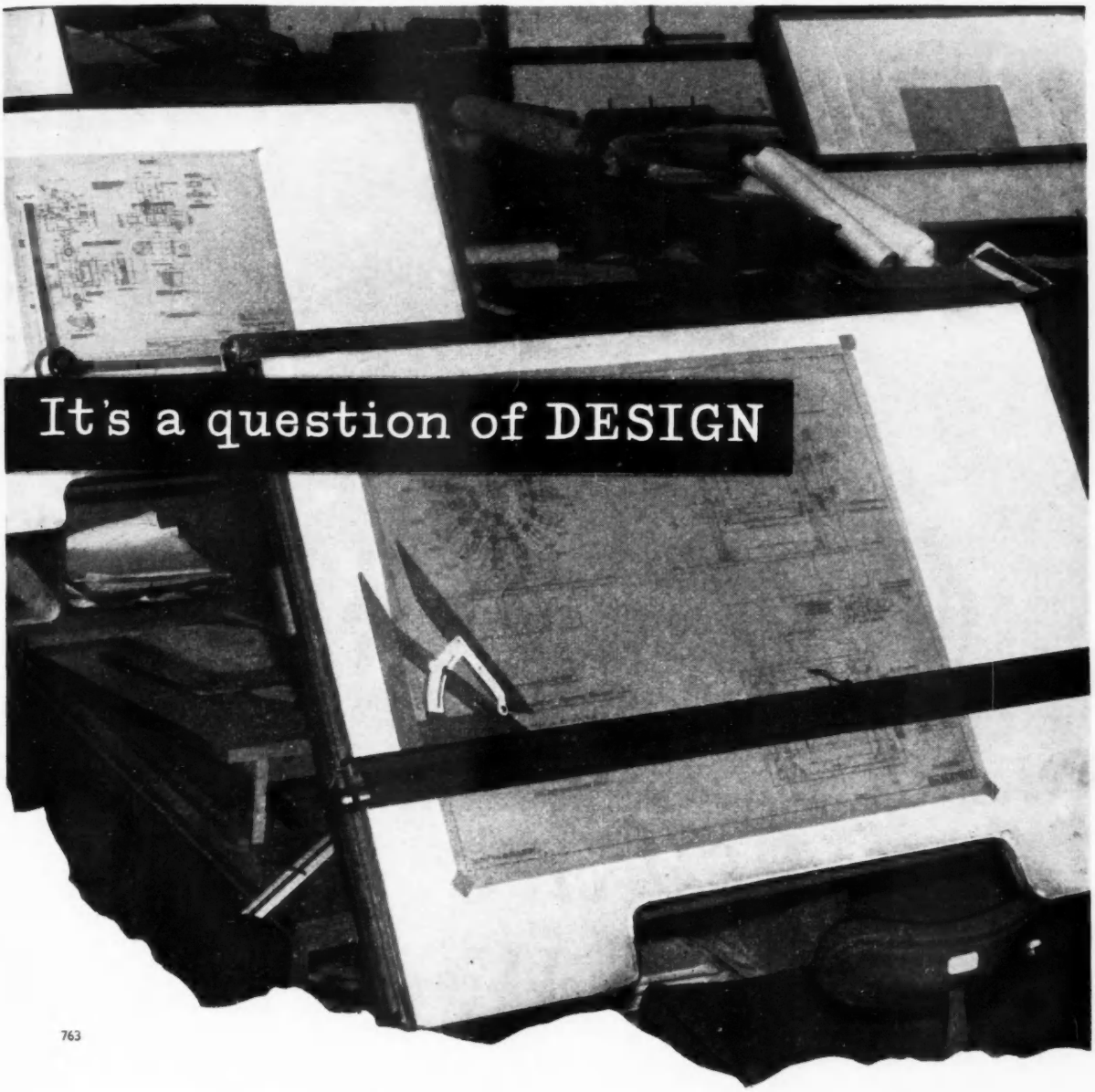

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The large centre illustration shows the new Power House with the A.C. and D.C. Switchgear for controlling the 2400 KW Alternator and the 850 KW D.C. generator of the new turbine set.

In the lower illustrations are other switchboards and motor control gear typical of those throughout the mill.

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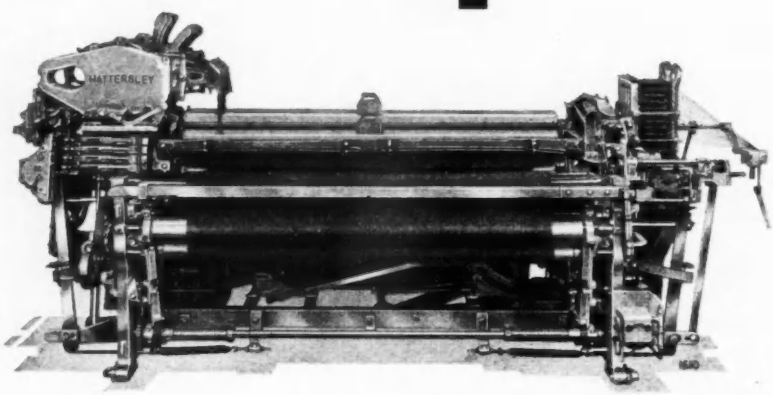

The Hattersley Automatic Light Standard Loom has been designed to weave woollen and worsted dress goods fabrics at high speed. The Loom is available in three forms

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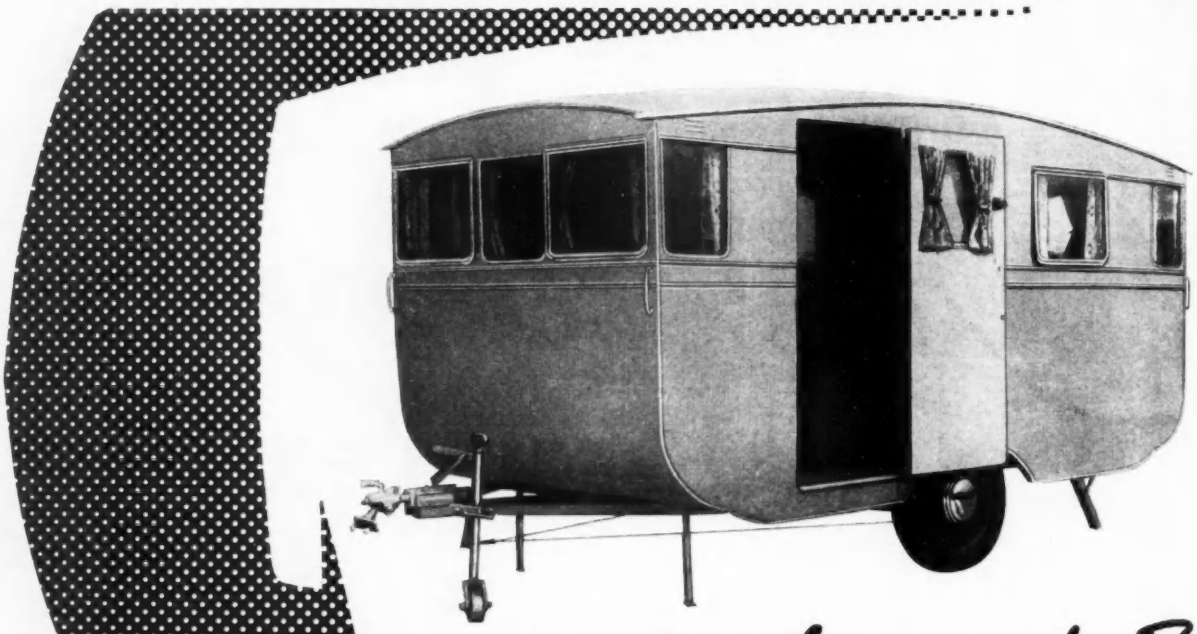

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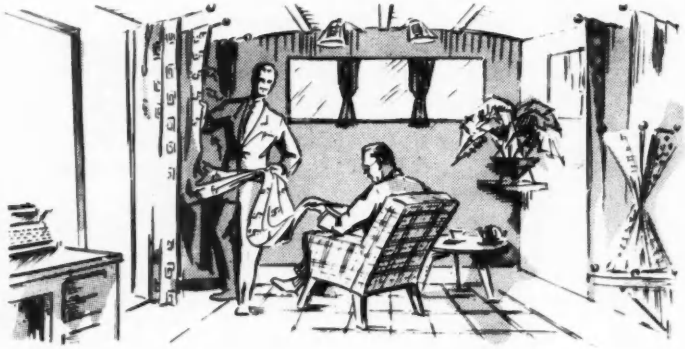

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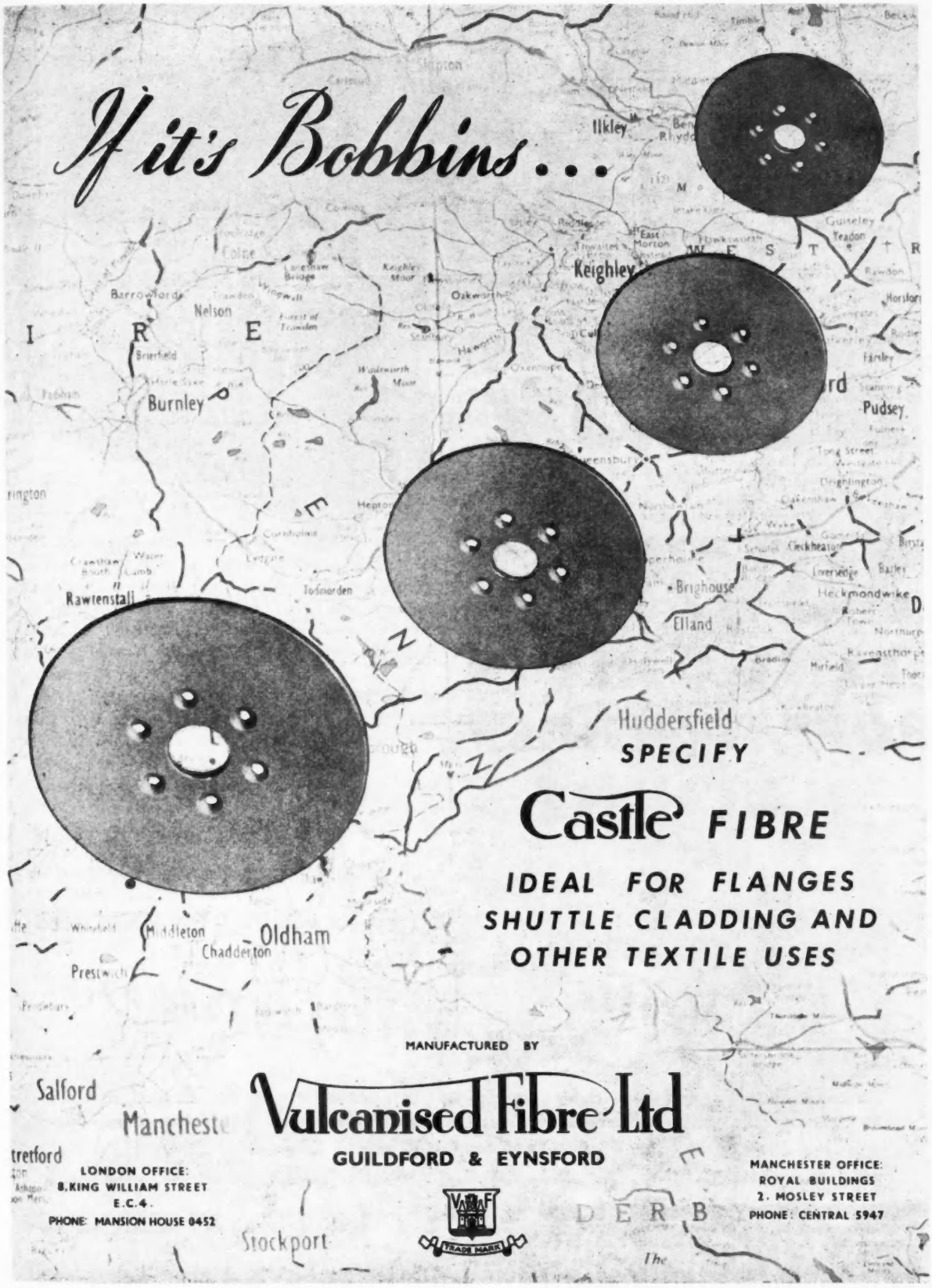

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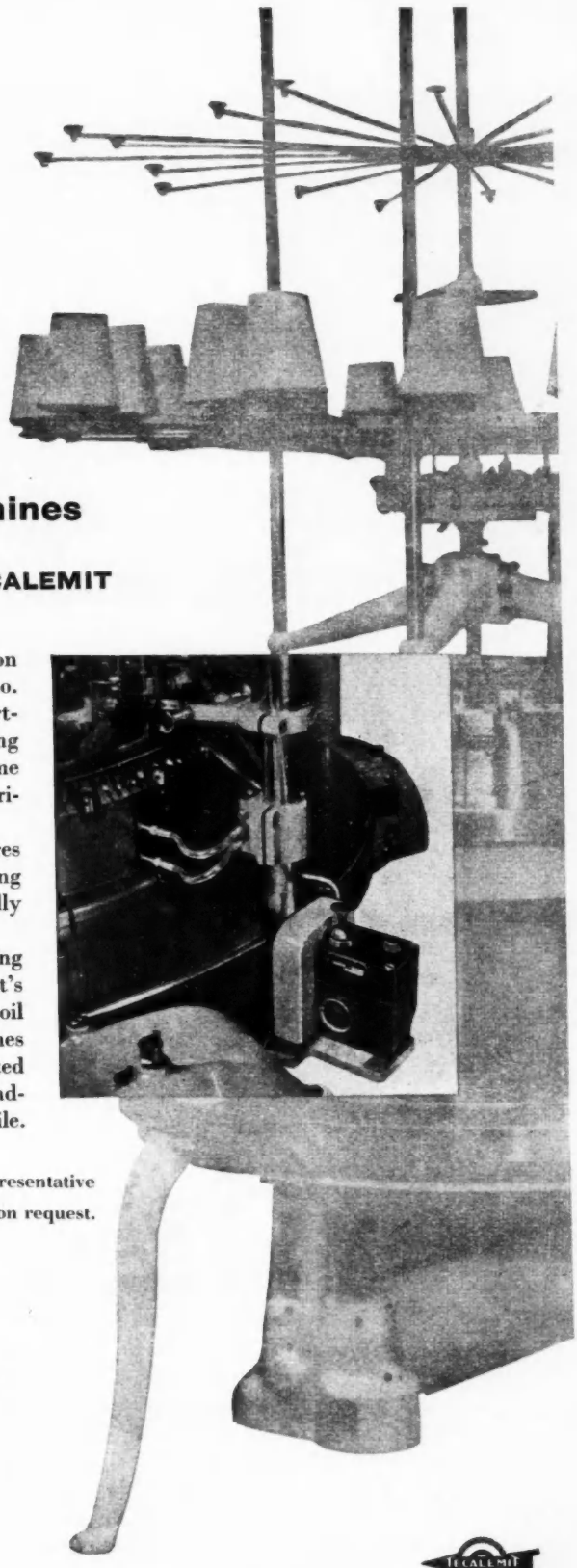

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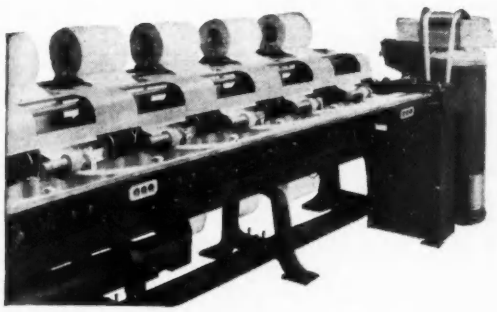

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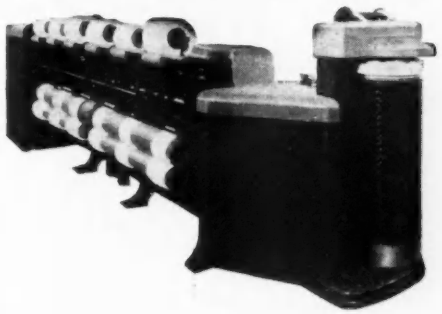

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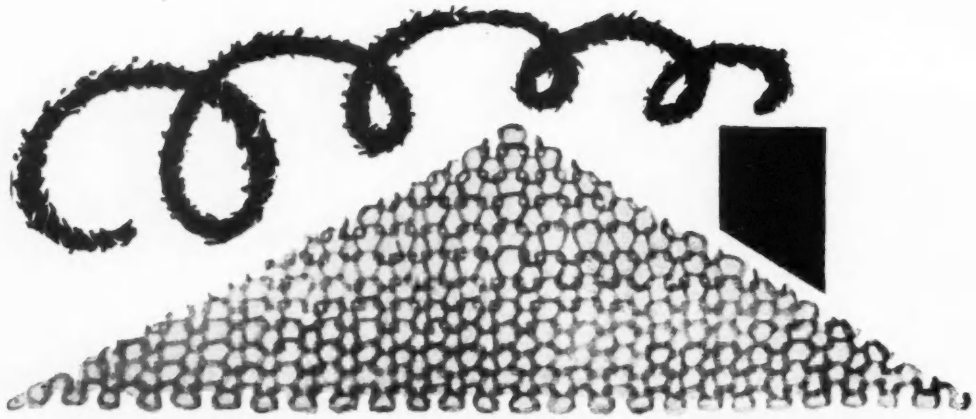

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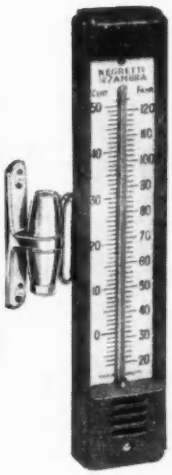

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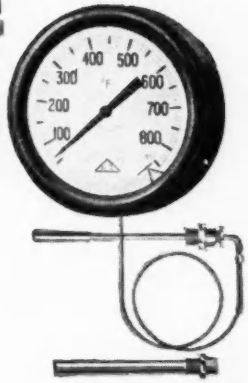
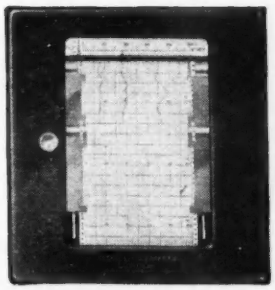


Distance-type Mercury-in-
steel Dial Thermometer



Resistance Thermometer
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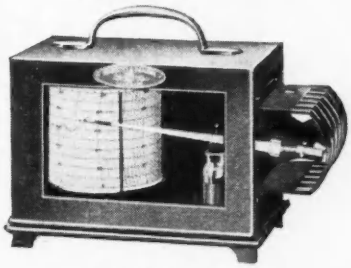

Bi-metallic Recording
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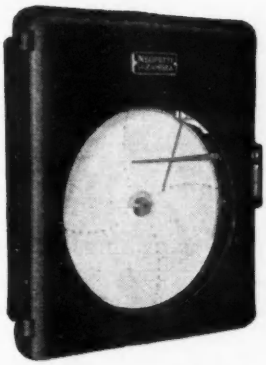

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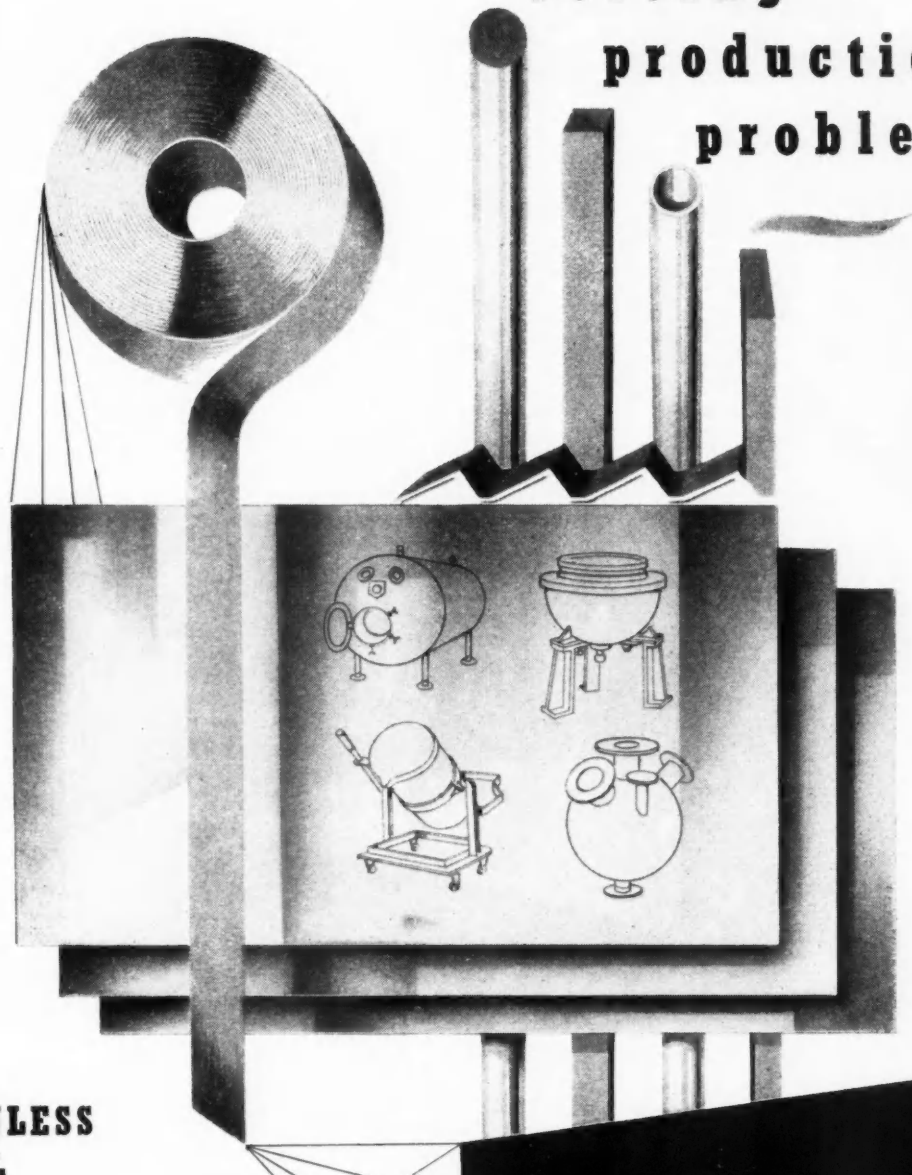

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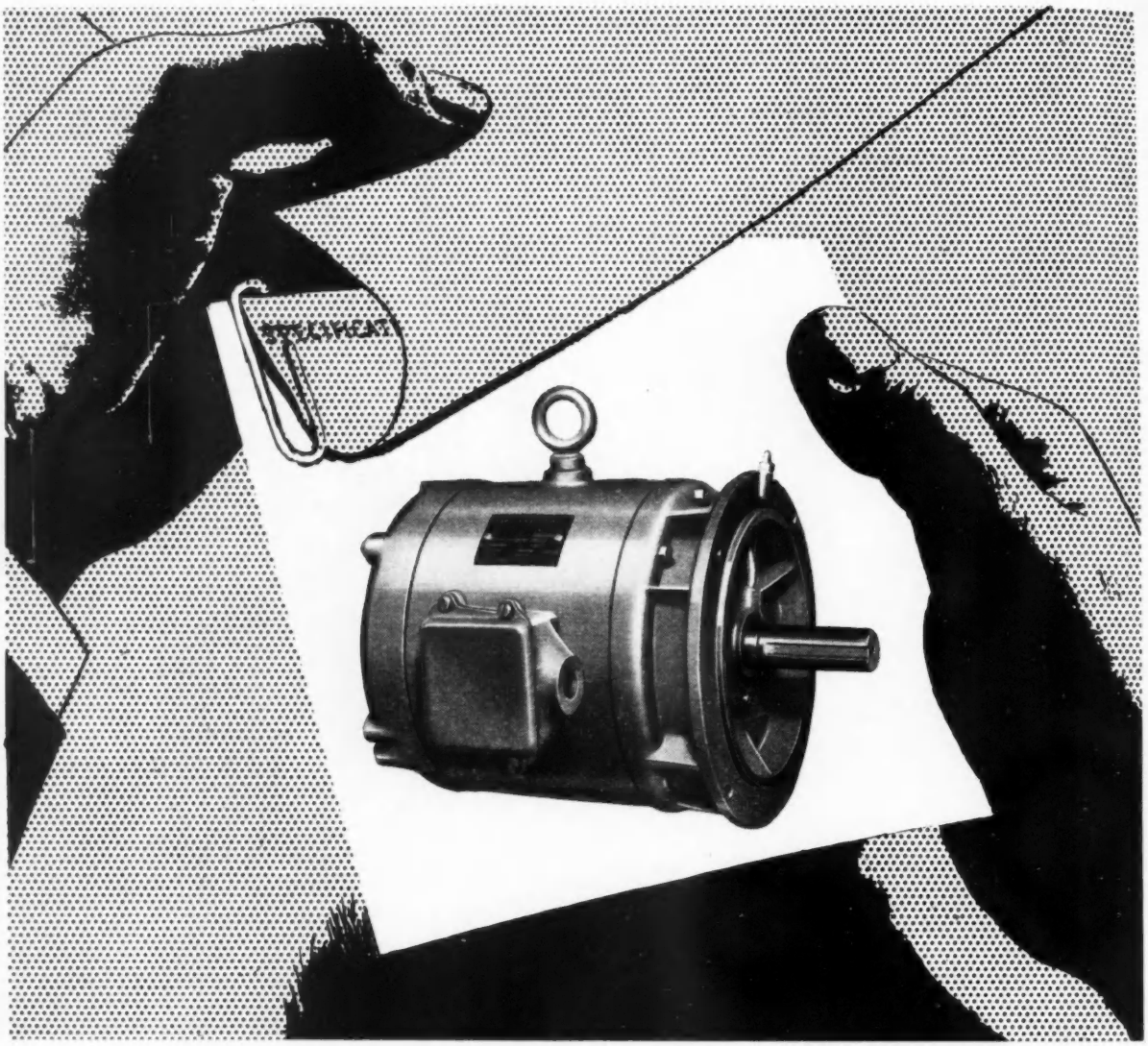

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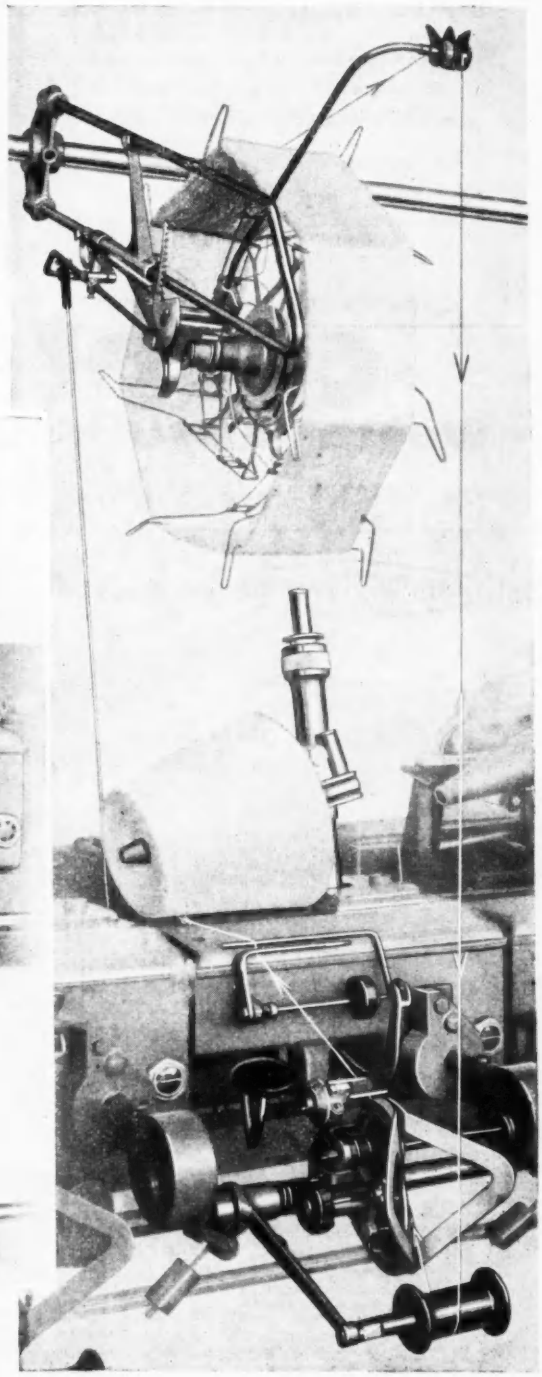

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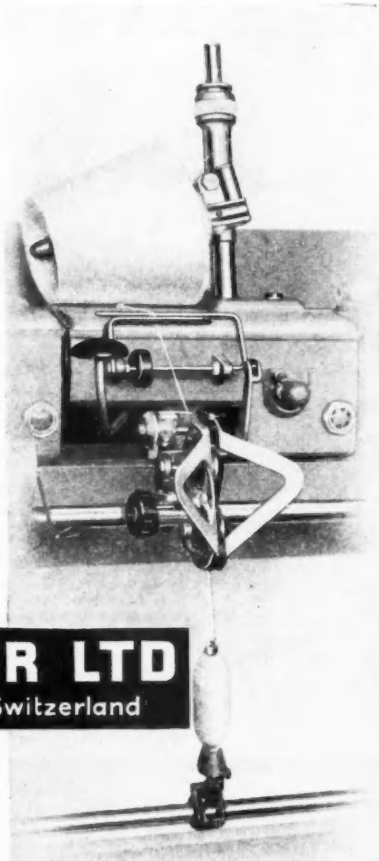

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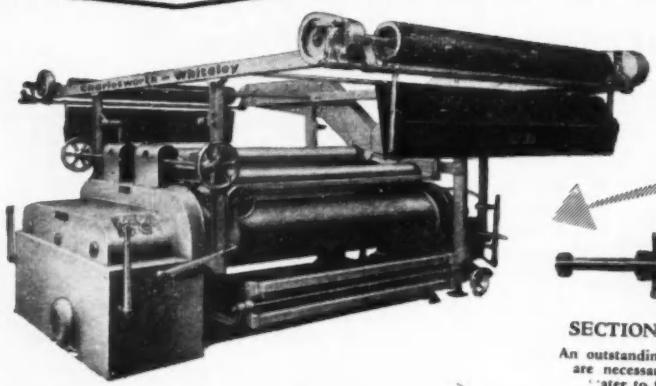

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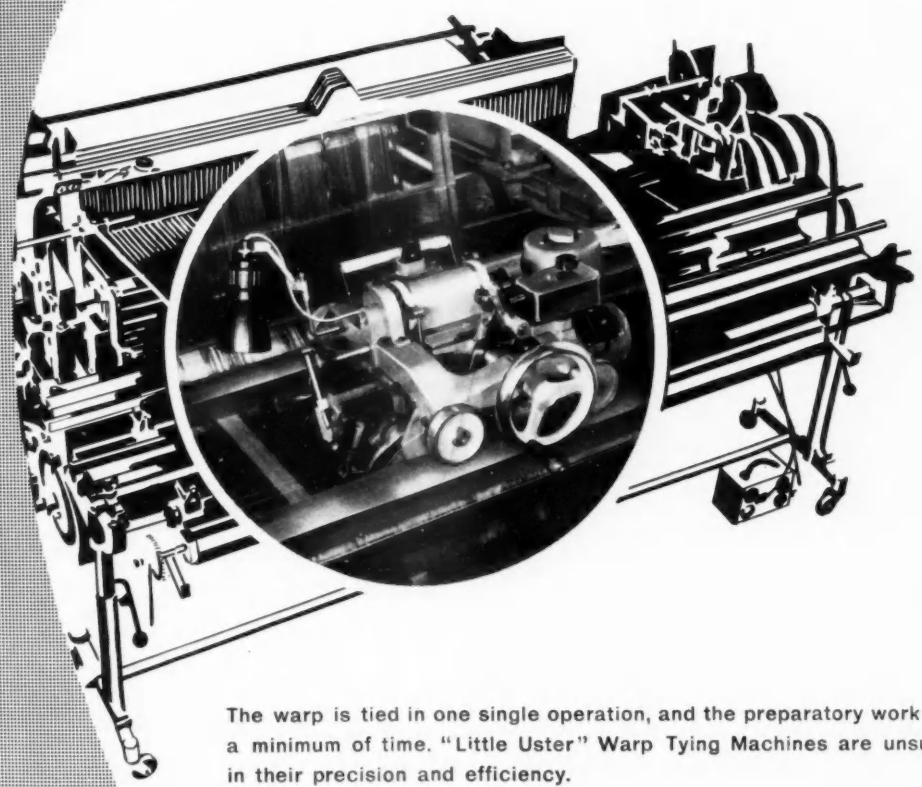

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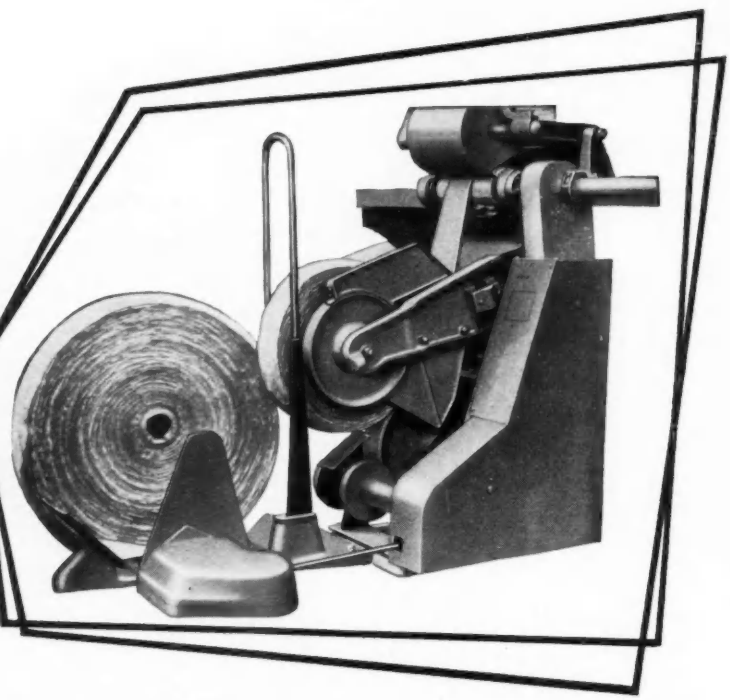

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THE TEXTILE MANUFACTURER

MATERIALS - PROCESSES - PRODUCTION - MANAGEMENT

NO. 998. VOL. 84 - FEBRUARY 1958 - MONTHLY Two Shillings and Sixpence

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THE TEXTILE MANUFACTURER (*Incorporating* TEXTILE INDUSTRY AND EXPORTER, THE TEXTILE MACHINIST, THE HOSIERY, LACE AND SILK MANUFACTURER, *and* THE TEXTILE COLOURIST) is published on the first Monday of every month.

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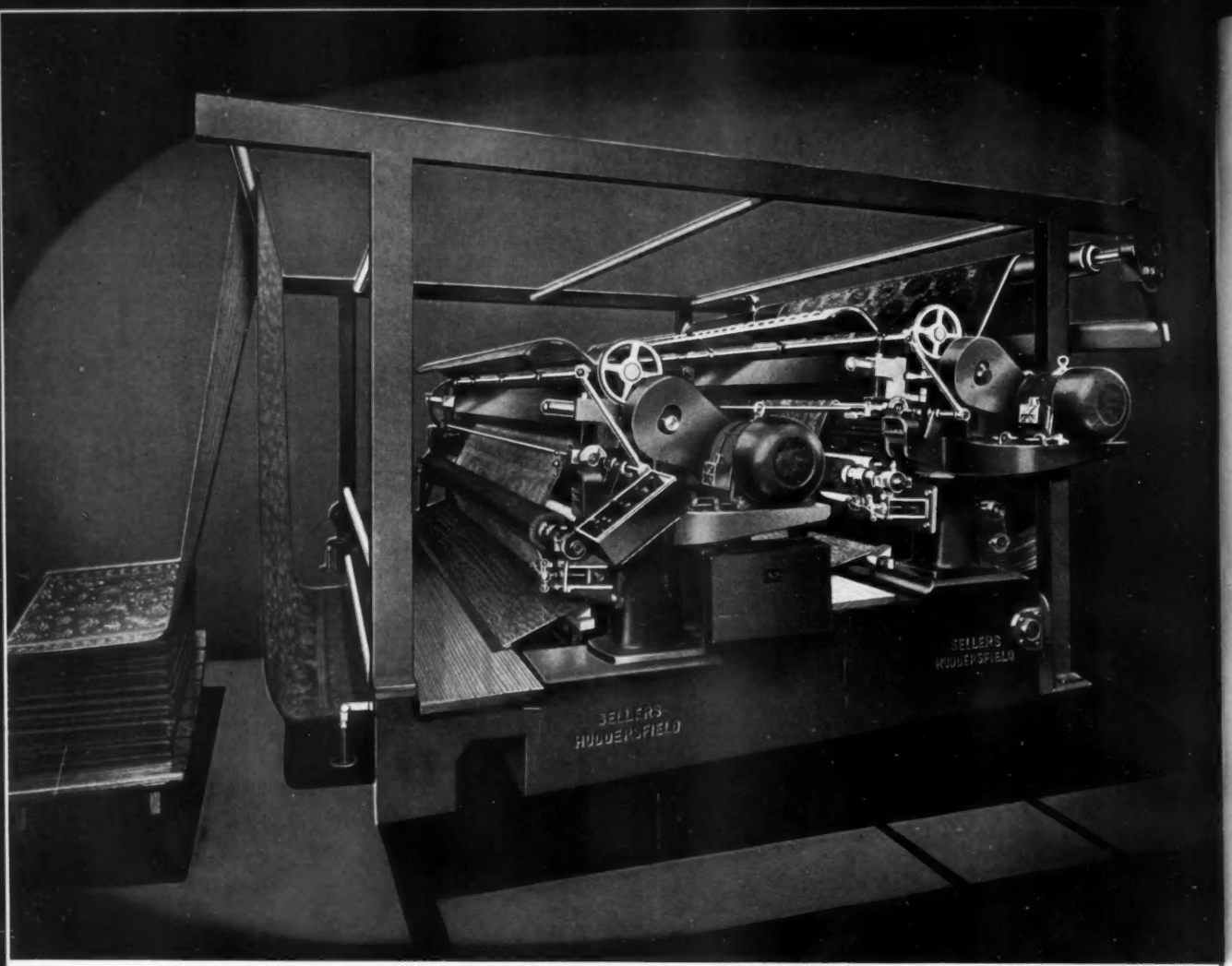

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THE TEXTILE MANUFACTURER

No. 998. Vol. 84 Two Shillings and Sixpence February, 1958

Notes of the Month

COTTON INDUSTRY AND THE FREE TRADE AREA

TRADING conditions in the cotton industry have tended to deteriorate and order books have shortened during the past few weeks—in some cases very substantially—states Sir Alfred Roberts, general secretary of the Cardroom Operatives Amalgamation, in his latest quarterly report to members. Buyers, he points out, generally appear to be doing little more than ordering for immediate requirements and allowing stocks to run down. To some extent this is due to the uncertainty caused by recent fluctuations in raw cotton prices but there can be little doubt that the present high interest rates, coupled with the other economic measures announced by the Government in September have provided the major reason for the slackening-off in demand. Merchants and wholesalers, however, cannot permit stocks—particularly in continuity lines—to fall below a safe level, he says, even when the carrying of such stocks is more expensive in terms of interest charges and it would seem that some of them have reached the stage when they must begin to replenish their stocks. Much will depend in the next few months on the way consumers react to the economic conditions at home and how far the economic recession in the U.S. is allowed to develop and is likely to affect this and other countries. At the moment, there seems to be no reason to be unduly pessimistic so far as home trade is concerned, in spite of the many extended stoppages over the Christmas holiday period.

On the other hand, says Sir Alfred, export trade continues to give cause for concern. For the 10 months ended October 31, 1957, *exports* of woven cotton fabrics were 380,468,000 sq. yds. (£50,170,863) compared with 583,223,000 sq. yds. (£72,139,264) for the same period in 1953. In contrast, and for the same periods, total *imports* of cloth in 1957 were 353,045,000 sq. yds. (in 1953, 77,950,000 sq. yds.) and yarn in 1957, 11,712,742 lbs. (2,861,006 in 1953). The bulk of these *imports* have continued to come from India and Hong Kong. According to figures supplied from Government sources in Hong Kong, there are now 440,000 operatives employed in the textile industry out of a total labour force of 1,320,000. Pakistan is also rapidly building up a large textile industry. In Karachi alone—capital of West Pakistan—45 new textile mills have been built since 1949, employing over 100,000 operatives at low wages. It is impossible for us to compete with such low wage countries, yet the Government will take no action to restrict the free flow of textiles to this country and appears content to leave us as the only textile producing country in the world which permits free and unlimited access to its home market.

Total production of yarns for the period under review showed a slight increase at 226,650,000 lbs. compared with 224,870,000 lbs. for the comparable period in 1956. The average weekly output was 17,434,615 lbs. compared with 17,256,154 lbs. in 1956. The labour force "on the books" revealed a modest increase during the quarter and the number at work increased from 97,231 at the beginning of the quarter to 97,920. It would appear, says the report, that the percentage of mule equivalent spindles now running is approximately 75% with a much greater activity in ring spinning than mule spinning. The closing of mills since 1954 has affected mule spinning far more than rings. The number of mule spindles in place has fallen from 15,760,000 to 12,140,000 in the three-year period—a loss of 3,620,000. During the same period, the number of ring spindles in place has been reduced from 10,830,000 to 10,320,000—a loss of 510,000. A substantial number of these ring spindles were in mills that have been closed down. On the other hand, many have been replaced by new frames which are now running on a two-shift basis, and therefore the number of operatives is comparatively unchanged.

On the European free trade area, Sir Alfred observes that it is probably correct to say the *cotton* industry will lose if this country participates in the area, although the effect will be gradual and—at first—imperceptible. But even this is not inevitable if certain safeguards are assured by the Government, and if the industry sets itself out wholeheartedly to stake its interest. We are concerned, he states, that the Government should not pay too high a price, *with the cotton industry as part of that price.* We are entitled as an industry to ask for safeguards and even for some forms of material assistance. The industry itself, however, must assume its responsibilities. Wage costs here are little different from those on the Continent when social charges are taken into account and we have proved that productivity here can be as high as in the U.S. It is up to the employers and merchants, if the free trade area come into being to organise their affairs to meet the challenge. What is often lost sight of by those in the cotton industry who argue against participation is that the Common Market is almost an accomplished fact. In our view, the operation of such a market in isolation would create many and much more serious problems for us. It would certainly immediately affect our exports to Europe, and could possibly exclude us altogether from Continental markets. It would seem, therefore, that from a purely selfish point of view, to join the free trade area is the lesser of two evils.

* * *

LINEN RESEARCH PROGRESS REPORT

PRODUCTION of level flax yarns of optimum quality was the main object of the research activities in the spinning section of the Linen Industry Research Association during 1957, stated Mr. D. A. Derrett-Smith, director of research,

at the recent annual meeting of the association. While most of the work had been devoted to all flax yarns, a good deal of attention had been given to spinning blends of flax with man-made fibres in the hope of securing some of the best of both worlds. In the weaving section, production of fabrics with accent on novelty had engaged attention and it was hoped to show some of these at the members' day in February. The "Linra" transparent sley guard designed to prevent accidents from "flying" shuttles without interfering with the work of the weaver was finding increasing favour in the trade. In the bleaching, dyeing and finishing section a good deal more had been discovered about sodium chlorite as a bleaching agent. Surprising things were possible, e.g., flax fibre could be bleached white and still be spinnable. Work on finishing fabrics made from blends of flax with man-made fibres occupied a prominent place in the work in this section.

Referring to the quickest and best way of dealing with their research problems—particularly the larger problems—and emphasising the need for speed in making research results available to the industry, Mr. Derrett-Smith pointed out that it was a mistake to go on hoping to reach finality and perfection before the co-operation of the trade was invited. When a research institute produced an idea they thought would work, it should be passed over to industry for trial under practical conditions while the research staff would be there to help during the process. There was perhaps a risk in seeking this co-operation too early but, in his view, the risk of doing it too late was very much greater. This type of co-operation would allow member firms to make their own influence felt on an idea. Commenting on the subject of technical education, the director said 11 students were now working at Lambeg. They received a subsistence allowance and one-half of their class fees, and a very good practical training during the day in all branches of research work. In the evening they studied for the B.Sc. degree in chemical technology. The objects were (*a*) to produce a pool of well-trained technologists to whom the institute could look for staff in the future and (*b*) to make a contribution to the production of technologists for the trade where modern machines and instruments were making increasingly insistent calls for men with this type of training.

Proposing the adoption of the report, Sir William Scott, chairman, paid a warm tribute to the work of the former chairman, Mr. H. B. McCance, who had occupied the position for 18 years, during which time the revenue from trade subscriptions had increased from some £7,000 to approximately £33,000 last year. During the year, said Sir William, there had been a marked change in the emphasis of the research programme and he thanked members for the way they had agreed to divert elsewhere the problems of testing, thereby freeing the staff at Lambeg for real applied and fundamental research work.

Stressing the importance of keeping alive the craft of flax growing in N. Ireland, Sir Graham Larmor, in his report said he fully recognised the impact which cheap fibres from abroad had recently made upon the industry's economy, especially on the coarser end of the trade but, he went on, it should not be forgotten that for a long period of time Russian-type flaxes were not available at all, and these circumstances could easily rise again. Concerning the institute's activities he said that development in high-speed modern preparing machinery and in ring spinning, in terms of output, also efforts in keeping yarns as free as possible from soiling during production were very worthwhile achievements.

RESEARCH SHOWS THE WAY TO BRIGHTER WOOLS

THERE was a tendency today to use brighter colours on wool, more intricate designs in printing, and to produce lighter weight worsted tropical suitings, said Mr. H. Lemon (Wool Industries Research Association) at a recent meeting of the Wool Education Society in London. The meeting of these requirements demanded a knowledge of the physical and chemical structure of wool, its properties, and how these properties could be controlled, he continued, and such knowledge could be supplied by the textile scientist. Describing the progress of wool research, Mr. Lemon said that high quality wool fabrics, such as those with which U.K. firms won several gold medals at last year's international event in Sacramento, California, were the result of modern craftsmanship combined with scientific skill. The modern textile craftsman was one who used to the best advantage the knowledge becoming available from scientific research. As early in 1892 it was discovered that wool treated with chlorine was resistant to felting, but early processing with chlorine solution was apt to be uneven and the wool was easily damaged. As a result, several improved methods were evolved at Torridon. In one of these, enzymes—the substances which cause fermentation—were used to modify the scaly structure of the fibre. For the finer qualities of wool a preliminary treatment with hydrogen peroxide was given, the process being known as Perzyme. By means of this process shrink resistance was obtained without any harshness of handle, said Mr. Lemon, and hand knitting yarns could be given a very lofty appearance and soft handle, and they dyed well, especially in pastel and baby shades. Another method, Chlorzyme, was one in which the wool was first given controlled treatment with chlorine gas and then subjected to an enzyme process. The result was a completely non-felting wool, and treated fabrics had a brilliant gloss and a soft handle.

Dyeing skills had been developed so that wool fabrics could be available in the brighter colours demanded today. A list of new colours for dress goods in 1909 included the following: "artichoke" (deep grey-blue green), "castor" (mahogany), coal-dust (deep grey), cocoa (red-brown), and raisin (deep purple). These should be compared with the gay tints in the British Colour Council's wool chart for next spring and summer, with names which spoke for themselves, such as fiesta pink, talisman red, sea turquoise, carnival green and lollipop pink. The use made of modern knowledge by dyestuffs manufacturers and the dyeing section of the industry had brought great changes in recent years, said Mr. Lemon. One way in which science served the dyer was to help him improve the fastness of his dyes to light and other effects. Research workers were also endeavouring to improve the fastness of dyes to the effects of smog and smoke generally. Some of the harmful ingredients were hydrocarbons, nitrogen dioxide and organic acids, most of which attacked both fibres and dyes. This work was being done at Los Angeles, among other places, where—surprisingly—there was apparently a particularly virulent brand of smog. Referring to "pilling" of wool fabrics, particularly knitwear, Mr. Lemon had news of a promising new line of research at Torridon. Pilling, the formation of little balls of wool on the surface of the garment, was caused by rubbing, which drew fibres out of the fabric, he said. Some success was being attained at Torridon by treating the under surface of a knitted fabric with an adhesive but it was too early to give details yet because the investigations were still in progress.

The Spinning Process

Twist is vital in spinning and the overlooker is responsible not only for providing the correct count but also the right t.p.i. Factors governing the amount of twist include the nature of the material, conditions under which it is spun and the purpose for which it is required

By N. ROPER, B.SC.(ECON.), A.T.I.

SPINNING is the last operation in the formation of thread, all subsequent operations having for their object the strengthening of the yarn, by combining two or more threads together, and afterwards arranging them in suitable form for weaving, knitting or any other purpose for which the yarn is required. It is also the last time that the fibres are drafted and since this is invariably done from a single roving end it is of prime importance that the roving be as uniform in cross-sectional area as possible.

Given a sound, uniform roving, spinning is a relatively simple operation and, providing the draft imposed is not excessive, or the counts too fine, a level roving produces a level yarn. If drawing is not carried out efficiently and an irregular roving is produced, this undesirable characteristic will become manifest in the final thread. Successful spinning depends upon successful drawing, hence the popular maxim "yarn is spun in drawing." This is not to say that careless attention to machine settings, etc., will have no deleterious effects on the spun thread; even the best rovings will produce "twitty" yarns by unskilful manipulation of the spinning frame.

As in weaving, three primary motions operate on the spinning frame: (*a*) drafting, (*b*) twist insertion and (*c*) winding-on. Drafting or reduction of the roving to the required count is achieved by means of two pairs of drafting rollers with some intermediate device acting as a fibre control medium to ensure as far as possible that no fibre moves at front roller speed until it is actually gripped by the front rollers themselves. The conventional method of fibre control used on the English system of worsted spinning is the same as that employed in Bradford open drawing, namely, carriers and tumblers assisted by pre-inserted twist. Twist is inserted into the roving during drawing to allow satisfactory winding-on; it is not essential for fibre control but its presence is taken advantage of in the drafting process.

For processing long wools and hairs it is usual to employ three lines of carriers and tumblers to prevent "sagging" of roving between the drafting points; two rows of carriers and tumblers are sufficient for fine crossbreds and merino wools. Some spinners prefer to use three rows for botany materials, but in the writer's view this practice is unnecessary, since the product is no better and it is impossible to set the back rollers sufficiently close to the front rollers to ensure best spinning conditions, particularly at the finer counts. English spinning frames employ light wood tumblers, whilst Continental draft units have heavy metal ones. This is because satisfactory drafting depends upon achieving certain optimum conditions of cohesion between fibres. French drawn rovings contain no twist, and the combination of heavy tumblers and twistless roving produces a similar fibre control arrangement as wood tumblers plus twisted roving.

Twist insertion is carried out on all spinning machines by causing the thread to rotate about its axis. In drawing the amount of twist used is very small and it is not usual to quote numerical values; it is doubtful if many drawing overlookers know the actual amount of twist being used on

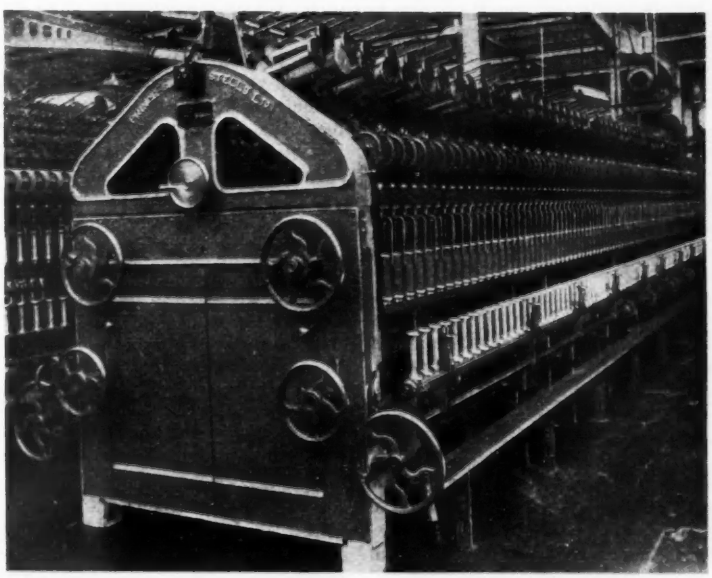


Fig. 1. Aked - Prince-Smith flyer doubler

any particular machine. In spinning, however, twist is vital and the overlooker is responsible not only for providing the correct count but also the correct number of turns per inch. The factors which govern the amount of twist are the nature of the material, the conditions under which it is spun, and the purpose for which it is required.

Many attempts have been made to formulate a basis by which the twist for different counts can be calculated, but the author is not aware of any formula applicable to all materials over a wide range of counts. Twist factors are successful in cotton spinning, but wool is a much more variable raw material and experience is more valuable than calculus in this connection. When yarns are to be folded or doubled after twisting it is usual to arrange the spinning twist as low as possible consistent with a low end breakage rate. This is because twist vitally affects production. It is the usual practice to run spinning spindles at maximum speed and the turns per inch is altered by changing the speed of the delivery rollers. Thus an increase in twist is brought about by slowing down the front rollers and production is affected to that extent.

To produce two different counts of yarns of equal hardness, as regards twist alone, the one which is greatest in diameter requires proportionately less twist than the finer. It is unfortunate, since no yarn is absolutely uniform in thickness, that the working of this law is automatic in its action. The thicker parts reach their proportionate degree of hardness before the thinner places, therefore, as more twist is added, it runs past the thicker places, causes them to revolve, and passes into the thinner parts.

If, as is often asserted, mule spun yarn is leveller than frame spun, this law of twist distribution must be restricted in its action by some, as yet, unknown cause. In mule spinning the twist is absolutely free to run from any part of a full stretch of 64 ins. to any other part and since there is sure to be a place in the whole length which is considerably thinner than the rest, it will accumulate the full amount of twist it needs from all the rest of the 64 ins. But in throstle spinning there is seldom a length of 16 ins. between the guide eye and the winding on point and, therefore, there is only just about a quarter of the length for irregularities to draw upon. At least in theory, then, the twist in mule yarn cannot be more even than that in throstle yarn.

Twist thus aggravates yarn unevenness; a softer twisted yarn should look better than one hard twisted. This is not necessarily the case since twist causes the fibres to contract; thus the thin places absorb more twist and will contract to a proportionately greater extent than the thicker ones. As the twist is increased, however, the visual appearance of the thread deteriorates to a marked extent. There is therefore an optimum amount of twist for a yarn to achieve best results in the fabric and this optimum value will depend on count, fibre length, fibre surface properties and the arrangement of the fibres within the yarn.

After drafting and twisting the yarn is wound on to a suitable package by one of four main methods. It is the peculiarity of all throstle frames—flyer, cap and ring—that drafting, twisting and winding on take place simultaneously; this is in contrast to the action of the worsted mule when winding on takes place *after* drafting and twist insertion, during the inward run of the carriage. Of the four systems mentioned only the cap and ringframes are of major importance in England. The worsted mule is rapidly becoming obsolete and the flyer frame is now limited to a narrow range of yarns. In recent years the ringframe has steadily increased in popularity owing to its suitability for the building of large packages.

Flyer Spinning Frame

The flyer system is the oldest type of continuous spinning and is still considered indispensable for the production of certain classes of yarn. The system is without rival for producing smooth yarns from long English wool, mohair, alpaca and other lustrous materials. The production of a smooth, lustrous yarn is due to the slow spindle speed and the absence of a yarn "balloon." Any material can be spun on the flyer system to thick counts and tremendous weights of hand knitting yarn are so produced. The disadvantage of the flyer frame is that the thread has to pull the bobbin round against the friction of a drag washer, as in open drawing, and fine yarns are not strong enough to withstand the tension imposed. This, together with its slow spindle speed, makes the machine economic only for the coarser counts.

The original flyer frame was a miniature reproduction of the open drawing rover; drafting, twisting and winding on being carried out in an identical manner. This machine had a maximum spindle speed of 2,500 r.p.m. and doffing was slow and laborious. Most present day flyer frames have mechanical doffing and this has necessitated a revolution in the design of spindles and flyers, giving spinning speeds and productions far in excess of anything obtained before on the old type of frame. In addition to higher spinning speeds, mechanical doffing motions are of great value since young doffing labour is hard to get and the time taken in doffing, usually less than one minute, considerably improves the efficiency of the machine, especially on coarse counts. Two types of self doffing flyer spinning frames are available, namely, the dead spindle type and the revolving spindle type.

Dead Spindle Machine

The dead spindle frame is very simple in construction and operation, the doffing process being achieved in a few seconds. Flyers and whorles are carried in ball bearings from above, the whole acting as oil reservoir. This arrangement ensures smooth running at high speeds, as there are no unsupported parts to get out of balance. The bobbins are carried on brass tubes, rotating on dead spindles fixed in the lifter plate, the drag being obtained by felt washers. Since there is no connection between flyer and spindle, the yarn has to stand the increased strain of rotating the spindle as well as the bobbin. As a result the machine is limited to the thicker counts; rarely does one find counts finer than 1/20s being spun on dead spindle frames. The machine is very popular, however, since the doffing motion is so simple and there is little opportunity for major disorders to occur.

The Aked – Prince-Smith doffer, shown in Fig. 1, has a doffing mechanism consisting of two lifter plates one carrying the full bobbins and the other the empty bobbins. When doffing is complete the doffing cycle consists of exchanging one lifter plate for the other, by means of the manipulation of a carrying rack in a horizontal direction and various lifting devices in a vertical direction. Doffing is also very simple on the Boyd self doffing frame which has two sets of spindles, one set mounted on top of the bobbin rail and one set on the under side. The bobbin rail is carried on axles mounted on traversing slides worked by racks and pinions and is rigidly locked during spinning. Empty bobbins are put on the lower spindles while spinning is in process. When the other bobbins are full, the frame is

stopped and by giving a half revolution to the bobbin rail the full bobbins are removed from their spinning position and the empty bobbins moved into spinning position (see Fig. 2). Operations are as follows:—

(1) **Square flyers and revolve bobbin rail (a half turn) to doff full bobbins.**

(2) **Wind some coils of yarn from full to empty bobbins by turning the cylinder, then cut yarn and start.**

A frame can be doffed in less than half a minute from stop to start.

Revolving Spindle Doffer

The Prince-Smith revolving spindle doffer, illustrated at Fig. 3, retains the principle of having overhung flyers, but an important addition is the presence of "live" spindles attached to the flyers. The "live" spindles, which are supported at the base in footsteps, are the chief feature which makes this machine suitable for the production of fine, softer twisted yarn because their rotation assists the bobbin in its revolutions and therefore eases the drag on the yarn. Botany materials up to 28s counts and lustre, mohair and alpaca yarns for moquettes, linings, etc., up to 40s counts are possible.

Due to the presence of the "live" spindles and the footstep rail, the doffing operation consists of lowering the footstep rail and lifter plate clear of the spindle feet, followed by two movements for securing the washers on the lifter plate and supporting the bobbins. The whole spindle unit is then swung out at an angle and the full bobbins dropped on the reception pegs. A further movement inward brings the spindles in line with the empty bobbin pegs, which are raised on to the spindles and secured. The unit is then returned to the spinning position and the lifter plate and footstep rail brought back.

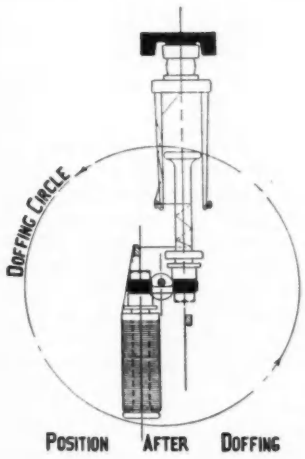


Fig. 2. Doffing cycle, Boyd frame

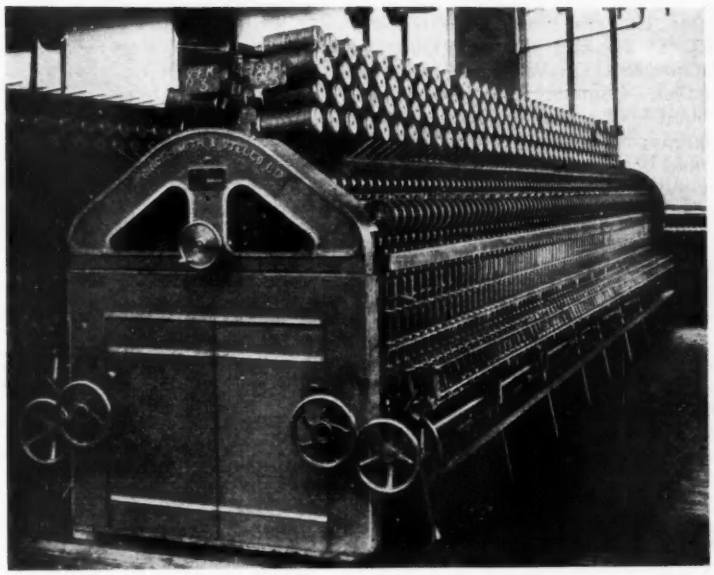


Fig. 3. Revolving spindle doffer (courtesy Messrs. Prince-Smith)

Cap Spinning

The cap spinning system is undoubtedly the most popular method in Britain. It scores heavily on the grounds of ease of manipulation, there being no drag washers or travellers to adjust, while it is able to cope successfully with a very wide range of materials and counts. Recent developments, however, suggest that this system has almost, if not quite, reached the limit of its possibilities in regard to both speed and size of package, and for this reason it is probable that it will gradually lose ground in favour of the ring system.

Except for short wools, in the spinning of which the mule is superior, the cap frame is the best for spinning fine wools and fine crossbreds for warp and weft. The cap frame is suitable for producing all classes of coating and hosiery yarns, except very thick counts, and on account of its greater productive capacity, it is often used in preference to the flyer system for spinning yarns required for pile fabrics.

Fig. 4 shows the construction of a cap spindle and the method of winding on. The spindle itself is short and fixed into a stationary spindle rail by means of a set screw. The top is tapered slightly and carries a steel bell or cap which like the spindle, never moves during the process of spinning. The sole purpose of the cap is to guide the yarn to its rightful position on the bobbin. This is done by the smooth lower edge of the cap, round which the thread gyrates when the machine is in operation. The spindle, in addition to supporting the stationary cap, also acts as a bearing for the brass or phosphor-bronze tube.

Sweated to the tube is a steel whorle which has two small pegs over which the bobbin fits. The bobbin and tube thus form a single unit and revolve together by means of a tape drive from the cylinder. The tube rests on a steel friction washer which in turn rests on the lifter plate traversing the bobbin

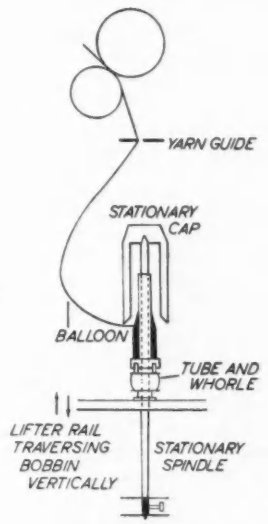


Fig. 4. Cap spinning

inside the cap. A felt lubricating washer is also incorporated to lubricate the spindle and prevent heat generating friction. Common tube speeds are around 7,000 r.p.m. For best spinning conditions the centre of the spindle should be directly under the centre of the guide eye.

The yarn emerging from the front rollers is led through the guide eye and attached to the bobbin. As the bobbin rotates at high speed the yarn gyrates round the cap in the form of a curve or spiral usually referred to as the "balloon." Every revolution of the balloon inserts one turn of twist into the yarn and this is responsible for a small amount of variation since the formula for turns per inch is:—

$$\text{Actual Twist} = \frac{\text{R.P.M. of tube} - \left(\frac{\text{Del. of Front Rollers}}{\text{Bobbin circum.}}\right)}{\text{Front Roll. Del.}}$$

Thus as the bobbin fills the balloon speed gradually increases and more twist is inserted. The twist variation is only small, however, at the most half a turn, and is masked by the greater twist variations due to yarn irregularity and so the point is more academic than real. A similar situation exists in ring spinning.

For winding on to take place the bobbin and thread must revolve at different speeds. In flyer spinning the bobbin is retarded by means of a drag washer but in cap spinning the bobbin is positively driven and such action is impossible. The bobbin, therefore, revolves at a uniform speed and the balloon is retarded by the resistance of the air to its whirling motion. Winding on therefore arises through the principle of bobbin lead. The friction between the thread and cap edge where the winding on actually takes place, plays only a very minor role in the retardation of the balloon.

In cap spinning three distinct causes of winding on drag or tension exist:—

(1) The relation of the diameter of the spool to the diameter of the cap.

(2) The length of air-resisting area of the yarn revolving round the cap.

(3) The speed of the thread through the air, or the air force acting against the moving thread.

All these factors must be carefully considered when determining the optimum spindle speed, size of cap and bobbin size. Thus the greater the diameter of the bobbin and the smaller is the strain necessary to make the yarn slip round the cap; this is shown by the fact that balloon tension drops as the bobbin fills, and spinning improves.

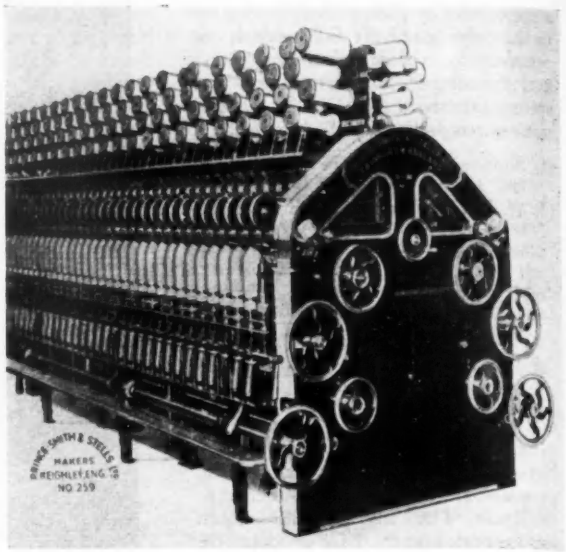


Fig. 5. Cap self-doffer (courtesy Messrs. Prince-Smith)

On the other hand, increasing the cap diameter produces an increase in drag. There are limits, therefore, to the size of bobbins which may satisfactorily be employed.

It would, of course, be possible to use longer bobbins, but this necessitates a longer, more expensive cap since the cap must be big enough to accommodate the bobbin. Then again, it has been shown that balloon tension is approximately proportional to the square of the balloon length, so that a small increase in balloon length produces a large increase in spinning drag. Similarly, drag is proportional to the square of the spindle speed. Thus the cap system, has limitations with regard to speed and bobbin size, which, even in the most favourable circumstances, will not contain much more than 2 ozs. of yarn. The chief advantages of the cap frame are:—

(1) The spinning tension is less than that imposed in ring and flyer spinning, so that finer counts are possible, and breakage rates are less and it may be possible to spin with one turn less twist.

(2) Changing the frame is simplicity itself. In flyer spinning a change of count from, say, 20s to 40s, requires a change in the size of drag washers and possibly the bobbin; in ring spinning it requires a change in traveller size. These operations are simple but tedious to perform, especially if several hundred spindles are involved. In cap spinning, however, changing the count produces an automatic change in tension since drag is proportional to the thickness of the whirling thread. A change in count from 20s to 40s produces a decrease in tension which, of course, is required for the finer count.

Hand doffing is very simple on the cap system, one person being able to doff a side of 100 spindles in 5 mins. A mechanical doffer cap spinning frame is, however, available as shown in Fig. 5, whereby doffing time is reduced to about 1½ mins. per machine. In the long run a saving is also effected since bobbins and caps have a longer life since hand doffing produces greater wear and tear.

Ring Spinning

For many years this system was little favoured by spinners of oil spun yarns and it was only after the development of large package frames for reducing production costs that the trade began to take ring spinning seriously. The introduction of the self-lubricating ring had a great deal to do with overcoming difficulties in the spin, and today it is quite common to spin up to 40s counts on packages containing 4–5 ozs. of yarn.

Fig. 6 shows the schematic arrangement of a ring spindle. The spindle is short and revolves in an oil reservoir. Fitted to the spindle is a steel whorle carrying two pegs over which the bobbin fits so that spindle and bobbin form one unit and revolve together. Surrounding the spindle and bobbin is a stationary steel ring firmly fitted in an opening cut out of the ring rail, which is also the lifter plate. Running round the ring is a small ear-shaped or semi-circular traveller. After drafting, the strand of fibres passes through the guide eye, under the traveller and is attached to the bobbin. When the machine is set in motion the bobbin revolves and the high speed produces

a yarn balloon, similar to that formed in cap spinning, and the gyrating thread pulls the traveller round the ring and is wound on to the bobbin at right angles to the traveller.

Retardation of the ballooning thread is accomplished by the force required to pull the traveller round against the friction of the ring and the air resistance to the yarn itself. Larger rings or smaller diameter bobbins increase the strain on the thread since the winding angle is small and the traveller is pulled harder against the sides of the ring. This is well illustrated by the fact that spinning tension is highest when the bobbin is empty and decreases markedly as the bobbin fills

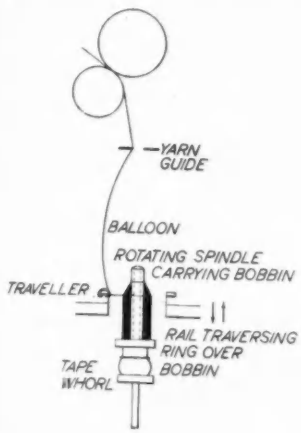


Fig. 6. Ring spinning

and its diameter increases. Longer bobbins mean longer balloons with a proportionate rise in tension. Thus on the conventional ringframe package sizes are confined within fairly rigid limits.

Ring spinning is most suitable for spinning yarns of all qualities in the count range 10s to 48s. Above 48s such a tiny traveller is required, in order to reduce the drag, that it would soon get hot and pull off the ring. Difficulties are sometimes encountered when spinning hair and carpet yarns since the strong, beardy fibres project outwards at right angles to the bobbin and if they make contact with the traveller a retardation of the balloon occurs with a consequent loss in twist and perhaps breakage of the end. Providing the ring diameter is large enough this defect can be reduced to insignificant proportions, always providing, of course, that the thread can withstand the higher tension due to the larger ring.

Large Package Spinning

Since spinning is the most expensive operation in converting tops into yarn it is natural that this process should receive the most careful consideration when it is desired to reduce production costs. One of the ways of increasing spinning productivity is the employment of large package spinning, for which the ringframe is most adaptable. The advantages of large package models, are as follows:—

(1) Greater length of yarn on a package.

(2) Due to the length of time it takes to fill a bobbin, the delays due to doffing are less frequent and machine efficiency is thereby increased.

(3) The lower number of doffs per day means less work for bobbin-setters, takers-off, etc., due to the smaller number of bobbins to be handled.

(4) Saving in wages.

(5) Much greater length of yarn on each spinning package means far less knots in later operations.

(6) Less frequent creeling in subsequent operations, such as twisting and winding, means that an operative can increase productivity by supervising more spindles.

"Magnum" Ringframe

The "Magnum" frame was designed to meet the demand for reduced production costs, while at the same time it effects a great reduction in the number of knots in the yarn, which is so much desired by weavers and knitters today. The machine is suitable for the same range as the standard ringframe. It will be obvious, however, that the greatest savings are effected when low and medium counts are being spun, and this new type of frame is gaining ground for the production of counts up to 36s.

The construction of the "Magnum" frame is identical with that of the standard frame, with the exception of the building motion, which has been adopted to actuate the spindle rail in addition to the ring plate. The build of the spool commences exactly as on the normal frame with the ring plate picking and gradually traversing until the spool is about half full. After this stage is reached, to prevent the balloon becoming shorter the spindle rail and the ring plate are lowered at the same rate of speed, and as the lifter motion continues to operate the traversing and picking of the ring plate in the usual manner, the building of the spool progresses.

The ring plate rises at the same rate of speed as the spindle rail is lowered, and, therefore a perfectly shaped spool is built. The best possible spinning conditions are thus allowed to prevail all through the spinning operation, and when the point is reached where further shortening of the balloon would not only cause a soft nose to be formed but would also make the spinning conditions worse, then the balloon is retained at that length for the remainder of the build (see Fig. 7).

"Parawind" Model

This machine is a standard ring spinning frame fitted with a special attachment to the builder motion. A parallel wind, hence the name, is employed which varies the length of traverse in such a manner that the nose of the package is diminished, giving it—when full—the outward appearance of a spool build. By this means it is possible to employ the parallel wind, and at the same time, by eliminating the bobbin head, reduce to a minimum the distance from the pot eye to the top of the spool, thereby improving the spinning properties of the machine. The "Parawind" possesses the following advantages:—

(1) Better spinning properties. The parallel wind ensures less variation in drag during the spin.

(2) Elimination of dirty yarn. All risk of yarn becoming soiled through exposure to the atmosphere in foggy weather is obviated. In

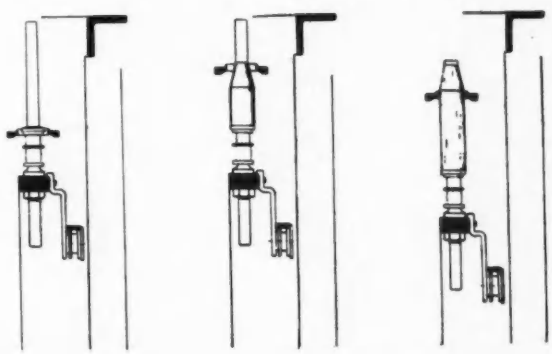


Fig. 7. "Magnum" Ringframe

addition, should the outside layers of the bobbins become soiled with grease, etc., they can be ravelled.

(3) Owing to the build of the package, the strain on the yarn is more even during unwinding in the creel of the twisting frame.

The "Parawind" frame is suitable for wool qualities in the range 56s to 70s, and up to 48s counts. The modified Scaife lifter motion produces the build of the bobbin by traversing the yarn the full length of the bobbin, shortening each succeeding layer, however, at the top of the bobbin until a certain minimum is reached, and then increasing progressively again to the full traverse.

"Velox" Ring Spinner

This is also referred to as the "mule-ring" spinning frame because this type of frame imitates to some extent the mule, in so far as the yarn comes direct from the front roller to the spindle blade extended above the paper tube and the twist is inserted over this length of yarn. The twisted yarn, which spirals around the spindle blade, then goes direct to the ring to be wound on the paper tube, by means of the traveller in the usual manner. Since the twist is inserted between the spindle point and the rollers and before any balloon is formed, the tendency to wildness is eliminated and end breakages are reduced. This type of ringframe is suitable for fine quality wool but when dealing with certain crossbred qualities where strong fibres are prominent, snarls may be produced at the spindle point due to the outstanding fibres in the yarn. The principle of the "Velox" frame is shown in Fig. 8. There are two models of this machine, a large package model designed to deal with counts from 4s to 40s and a high-speed model for 24s to 60s counts in qualities from 56s upwards for coating, hosiery yarns, etc.

Variable Speed Spinning

Variable speed motors have been fitted to many frames on the Continent and elsewhere. The principle is to make use of a variable spindle speed, decreasing the speed when the bobbin diameter is small and increasing it when it is large, so as to maintain a constant yarn tension throughout. Variable speed spinning is claimed to produce a yarn with greater uniformity of strength and elongation at a higher rate of production and with fewer end breakages, but despite this very few variable speed frames are employed in the English worsted industry.

(*To be continued*)

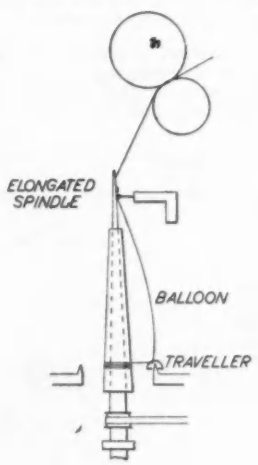
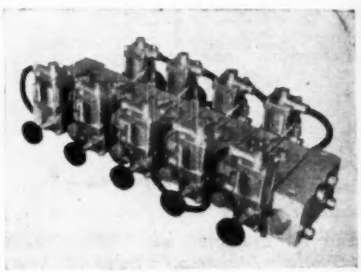


Fig. 8. "Velox" ringframe

Multi-Point Control Valves

A NEAT and economical method of grouping control valves at a central point in such a way that interconnections are eliminated has been introduced by Brookland Works, Dartford, Kent. Believed to be unique to the low pressure fluid power field, the valves—which may be fitted with manual, mechanical, electric solenoid or pilot operating mechanisms—are supplied as a multi-point "packaged unit." Any number of valves, up to a maximum of 12, can be embodied into a single unit. The supply and exhaust ports of all the valves are led into passages running the full length of the assembly, screwed connections being provided in special end pieces, which also provide facilities for mounting the assembly as a whole. Each end block contains one supply and one exhaust tapping. Tappings in each individual valve body provide fluid take-off points for solenoid pilot heads, where these are used. Each main control valve is therefore an entirely independent unit from the functional point of view. This facilitates servicing and also dispenses with separate pilot supply piping. To install the unit, it is necessary only to connect the main air or oil supply to one end block, and lead the usual connections to each power cylinder. For pneumatic service, protective hoods are fitted to the main exhaust ports in each end block, and also to the exhaust ports of any solenoid pilot mechanisms which may be incorporated. For hydraulic service, the user must provide one drain line only back to the pump reservoir, solenoid drains being fitted integrally in each valve element.



The multi-point solenoid valve "packaged unit"

Check, Plain and Fancy Worsteds

Photographed slightly larger than the actual patterns in order to show detail, the six excellent cloths on the facing page are a selection from the ranges manufactured by Martin Sons and Co. Ltd., Wellington Mills, Huddersfield. Brief descriptions are as follows:—

(1) R5023, C544. An 18 ozs. double plain worsted in two attractive shades of blue.

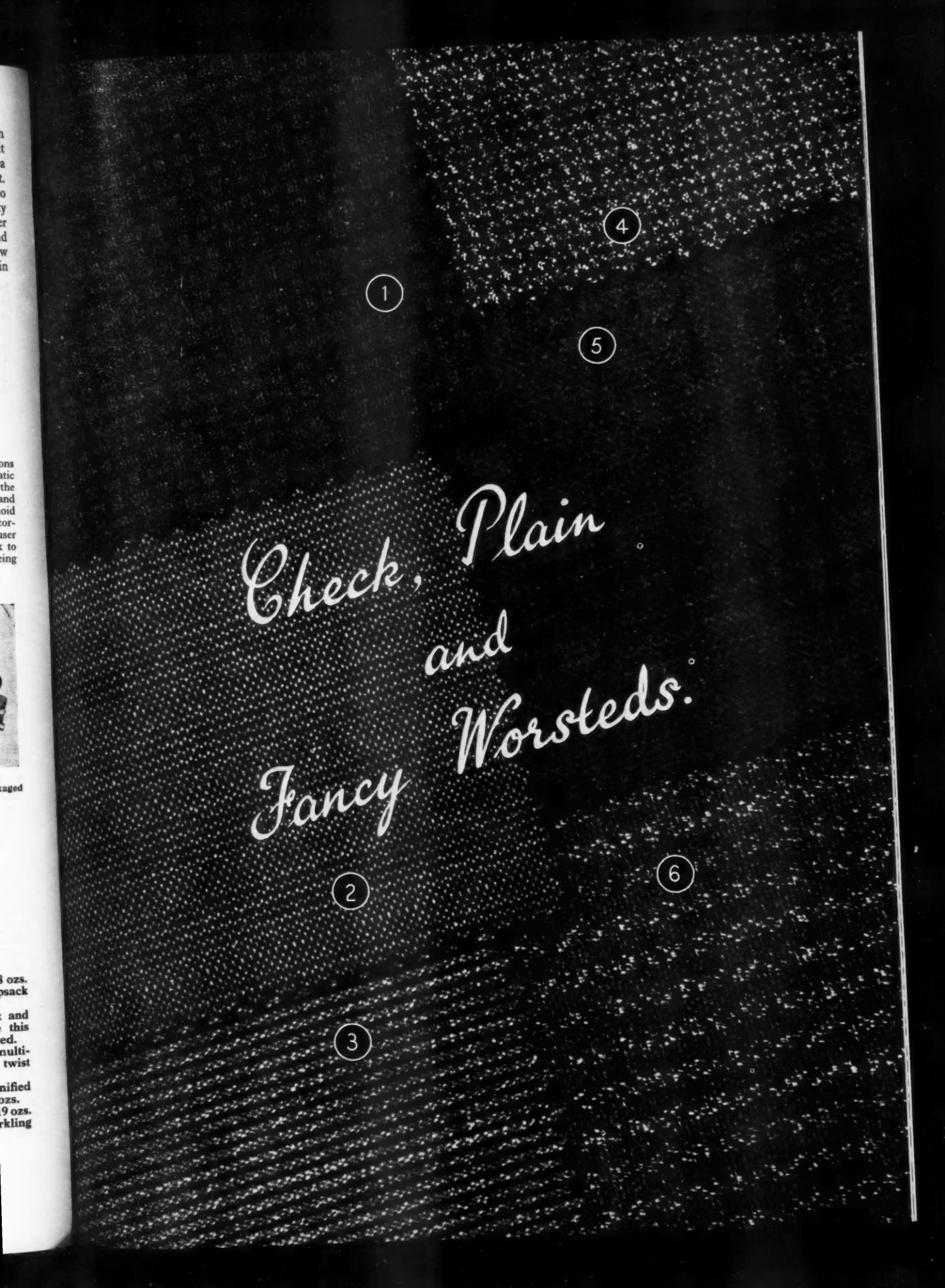
(2) R4972, C647. A very neat 17/18 ozs. fancy striped worsted in a hopsack weave.

(3) R5015, C654. Alternate black and mingled stripes characterise this 18/19 ozs. corded stripe worsted.

(4) R5016, C509. A distinctive multi-coloured, sparkling fancy twist worsted (18/19 ozs.).

(5) R4860, C638. A quiet, dignified Glen check worsted of 17/18 ozs.

(6) R4977, C651. A very smart 18/19 ozs. hopsack weave worsted, sparkling twist.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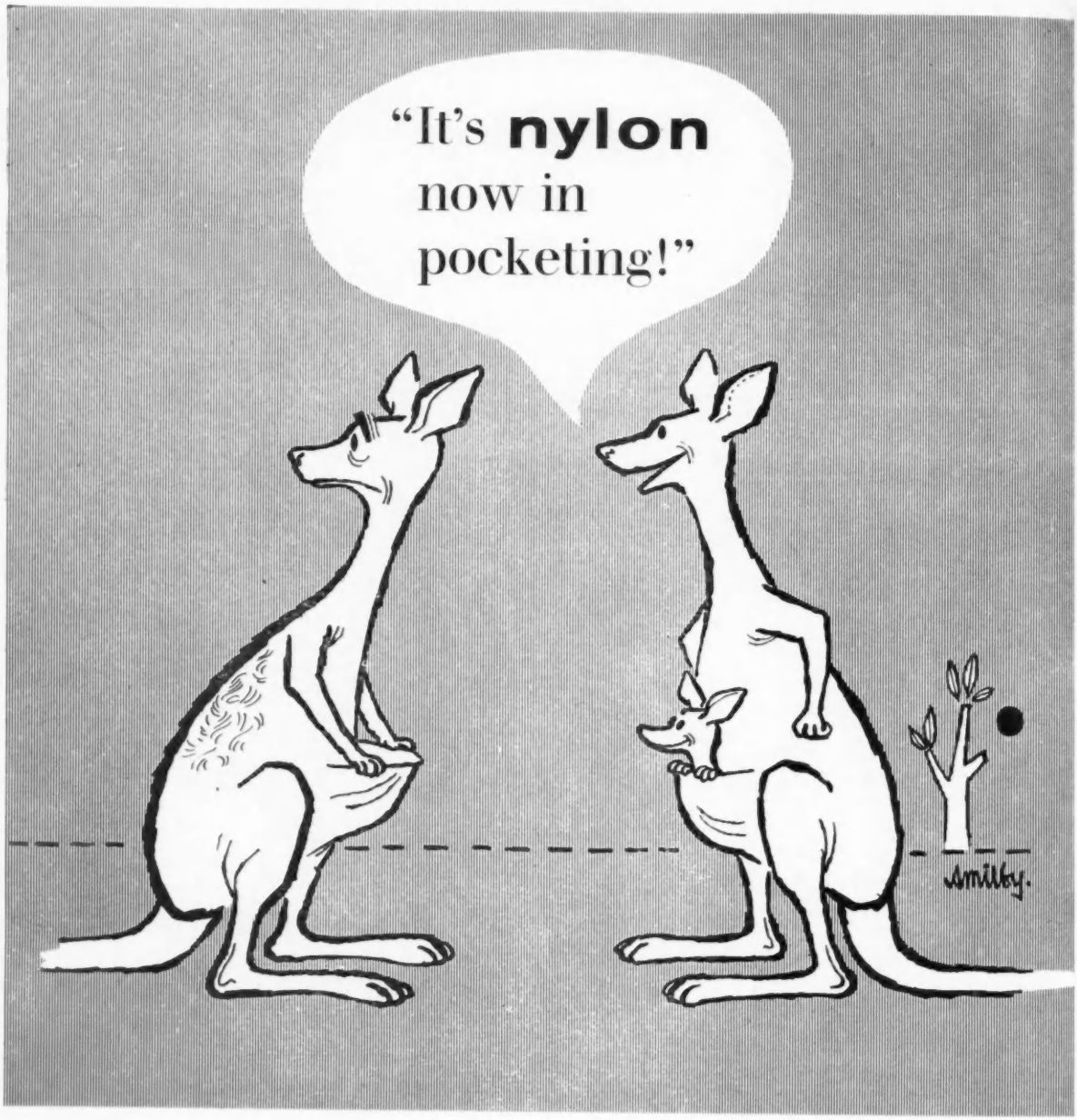

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A Study of Some Factors Affecting the Pulling of Rags*

The first two parts of this paper (Nov. and Dec. "T.M.") dealt with blending, oiling, feeding, various settings and the effect on production, etc. This third part is concerned with machine details and effect of swift speed on percentage fibre

(*continued from December "T.M.", page* 613)

By C. D. MEYER and P. P. TOWNEND, B.SC., PH.D., F.T.I.

THE standard used to assess the opening or bursting power of the rag machine was to determine the number and weight of thread and the amount of fibre in the different samples. Since the percentage fibre is complimentary to the percentage thread, i.e. a web containing 80% fibre will contain 20% thread, then reference will only be made to the former. It is very difficult to assess the fibrous matter in a pulled rag sample, but it has been demonstrated that the amount of thread in a carded sliver is related to the amount of thread in the original blend and so it was decided to pass each sample of shoddy once through a one-swift card in order to obtain a web which could be more easily examined.

Machine Details

The machine used was a Tatham one-swift card, 22 ins. wide, installed in the Textile Department of the University of Leeds. The various practical details are given in the following tables.

Roller	r.p.m.	Dia. (ins.)	Clothing
Swift	110	50	110/11/31
Doffer	1·3	29	120/12/33
Fancy	950	8	60/6/31
Fancy stripper	250	3	90/3/30
Strippers (6)	250	4	110/10/30
Workers (6)	0·8	7	110/10/30

Settings	
Worker No. 1 to swift	24
Worker No. 2 to swift	
Worker No. 3 to swift	
Worker No. 4 to swift	30
Worker No. 5 to swift	
Worker No. 6 to swift	

Sample Size

In order to justify the sample size 5 lbs. of rag were pulled under the same conditions and fearnoughted to obtain a uniform mix. The material was then carded continuously and two webs were collected at the doffer for every 8 ozs. of carded material. These twenty webs were examined for percentage fibre and number of threads, and the figures are set out in Table 14.

Testing

The webs were placed on a glass plate under which a light was applied to make the threads more discernible. It was decided to adopt the following definition of a thread: the "thread" must be more than $\frac{1}{8}$ in. long and the fibres constituting the thread must contain some twist, i.e. the fibres must be bound together. It was thought $\frac{1}{8}$ in. was a reasonable length to adopt when assessing thread content, since using a very short length of thread would have made identification of the threads difficult, as they would appear like neps. Moreover, in pulling out many short lengths of thread from the web, much loose and open wool would be pulled out with the threads thus increasing the apparent weight of each sample. The threads were then counted and removed, using a pair of worsted burling irons, and conditioned with the fibre for at least 24 hours in a standard atmosphere. Thread and fibre were then weighed on a sensitive chemical balance in order to determine accurately the percentage thread and fibre.

A glance at Table 14 immediately shows that the percentage fibre content did not vary from one sample to another and this, in itself, would seem to justify the use of 8 ozs. samples for future assessment. In order to ensure that the fibre content of the web is unaffected by the card being run off as must inevitably occur between one sample and another, the card was actually run off after the eighteenth sample and then run on for the nineteenth and twentieth, and it will be observed that the fibre content of the last two webs was the same as previously thus indicating that this practice is permissible.

Blending

It has already been established that reproducible results can be obtained by carding 8 ozs. samples, but if such a small quantity of shoddy is passed through a machine as large as the fearnought then the thread content of such samples varies. For this reason the samples were hand blended prior to carding. In order to justify this blending technique 225 gm. ($\frac{1}{2}$ lb. = 227 gm.) were blended and carded. Four webs, each approximately 40 ins. long and 20 ins. wide, were gathered from the doffer, the first web being collected after the card had run for 1 min., the second after 3 mins., the third after 5 mins., and the fourth after 7 mins. running. Each web was

Table 14

Web No.	No. of threads	Wt. of threads (gm.)	Wt. of fibre (gm.)	Total wt. of sample (gm.)	% fibre	No. of threads/gm.
1	80	0·072	3·510	3·582	98	23
2	74	0·071	4·010	4·081	98	18
3	72	0·071	3·700	3·771	98	19
4	99	0·103	4·120	4·223	97	23
5	76	0·091	4·380	4·471	98	17
6	94	0·101	4·040	4·141	98	23
7	77	0·090	4·470	4·560	98	17
8	110	0·092	3·770	3·862	98	29
9	97	0·092	4·271	4·363	98	22
10	88	0·090	4·190	4·280	98	21
11	62	0·070	4·320	4·390	98	14
12	114	0·103	4·550	4·653	98	25
13	91	0·101	3.710	3·811	97	24
14	103	0·101	4·160	4·261	98	24
15	87	0·101	4·450	4·551	98	19
16	120	0·103	4·930	5·033	98	24
17	69	0·071	4·160	4·231	98	16
18	97	0·100	5·220	5·320	98	18
19	76	0·072	3·710	3·782	98	20
20	88	0·072	4·790	4·862	98	18

* *An account of some original research work carried out in the Department of Textile Industries, University of Leeds.*

Fig. 4 (left). Percentage fibre in web 76·02

Fig. 5 (right). Percentage fibre in web 80·92

then divided into three parts—a, b and c. These webs were analysed for percentage fibre and thread and the figures obtained are given in Table 15.

In the light of these results it was decided to hand blend and card 8 ozs. of shoddy from each experiment and to take card webs after the machine had run for 3, 5 and 7 mins. In order to obtain some idea of the variation one might expect between two samples from the same rag, pulled under the same condition it was decided to pull

Table 15

	No. of threads	Wt. of threads (gm.)	Wt. of fibre (gm.)	Wt. of total sample (gm.)	% fibre	No. of threads/gm. of sample
Web No. 1—						
(a)	52	0·11	2·15	2·26	95·15	23
(b)	44	0·09	2·28	2·37	96·20	18·85
(c)	43	0·09	2·14	2·23	96	19·28
Web No. 2—						
(a)	36	0·08	2·30	2·38	96·70	15·13
(b)	41	0·09	2·30	2·39	96·25	17·15
(c)	47	0·09	2·39	2·48	96·45	18·95
Web No. 3—						
(a)	44	0·09	2·76	2·85	96·90	15·44
(b)	35	0·07	2·41	2·48	97·20	14·12
(c)	43	0·07	2·58	2·65	97·35	16·26
Web No. 4—						
(a)	31	0·06	2·41	2·47	97·65	12·55
(b)	34	0·07	2·92	2·99	97·65	11·37
(c)	42	0·07	3·05	3·12	97·75	13·46

Fig. 6 (left). Percentage fibre in web 85·83

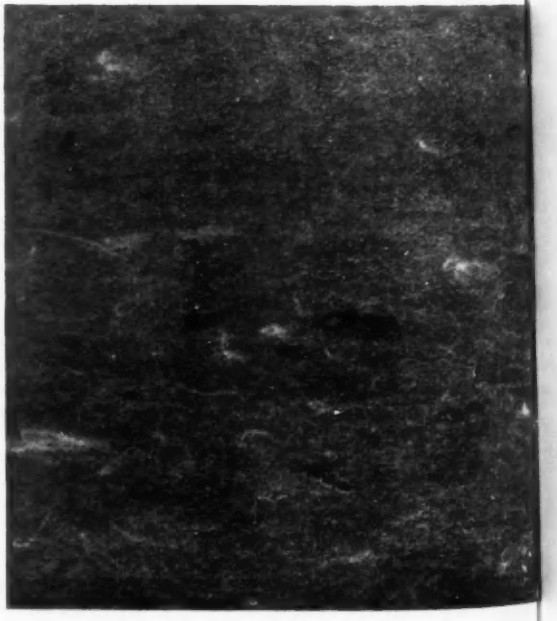


Fig. 7 (right). Percentage fibre in web 90·03

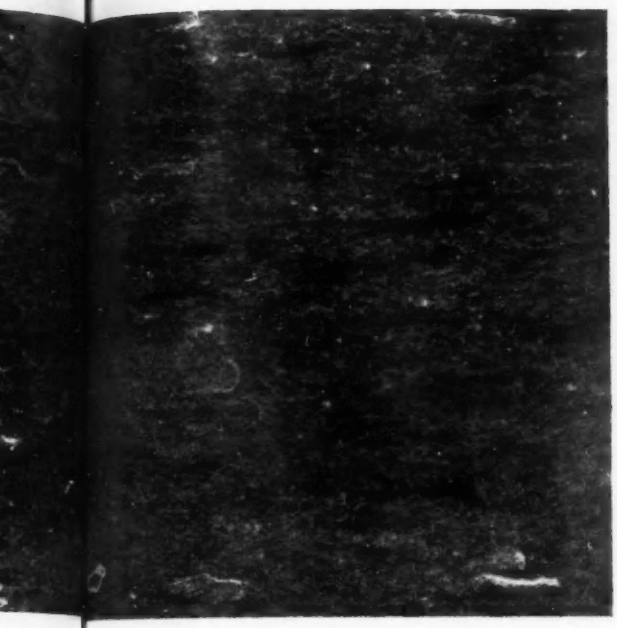
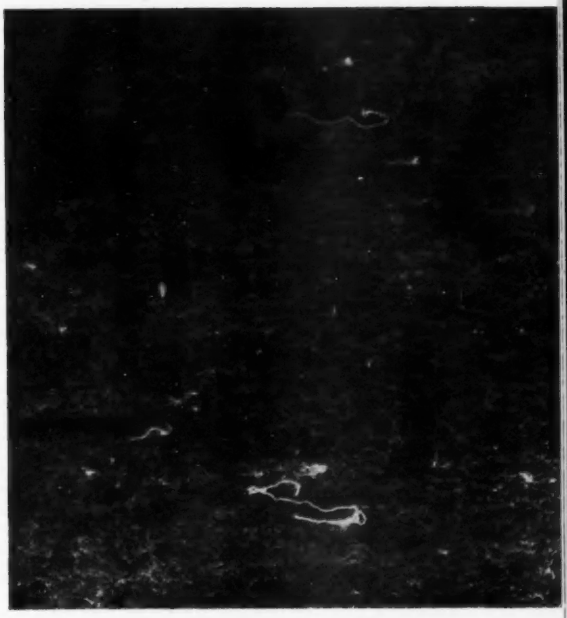


Fig. 8 (left). Percentage fibre in web 92·61

Fig. 9 (right). Percentage fibre in web 95·39



quantities of the same rags under the conditions of pulling set out in Table 4 (see "T.M.," Nov., p. 554). From Table 5 the material from the first seven experiments was carded and analysed. The data referring to the number of threads/gm. of sample and percentage fibre in the card webs are given in Table 16.

Table 16

No.	No. of threads/gm.	% fibre
111	58·92	89·73
112	69·74	86·19
113	65·36	90·21
114	42·60	92·47
115	41·98	91·99
116	50·83	89·37
117	43·78	91·55
Mean 126	50·90	90·54

Considering Table 16 it will be seen that four out of seven of the figures given for percentage fibre, i.e. 57% fall between 90 and 92%, and if one widens this range to 89–93% then 86% or six out of seven figures fall within this range. Taking these results into consideration it was clear, especially since most of the figures obtained for percentage fibre from the many experiments all fell within a range of 80 to 90%, that a detailed analysis of the figures obtained under any set of experimental conditions would not be justified. Therefore, the various figures for the percentage fibre from the different machine settings for the one variable under consideration have been added together, i.e. horizontally across the table and their means obtained. This is probably a better method of analysis for percentage fibre. However, in order to allow the reader to visualise the different appearance of webs containing varying amounts of fibre the six photographs, Figs. 4 to 9, have been reproduced from webs varying in fibre content from 75–95%.

Table 17

The Effect of Swift Speed on Percentage Fibre

Swift speed	Feed roller speed			Feed roller setting		Feed roller dia.	No. of teeth in swift			Bit box slide setting			Bit roller setting			Rate of production			Mean % fibre
	6	9	16	¼″	½″	2⅜″	2″	5 × 26 × 45	5 × 52 × 36	10 × 50 × 46	0 sq. in.	138 sq. in.	219 sq. in.	No	¼″	½″	1″	% fibre / lb./hr.			
428	81	87	76	87	83	87	87	86	87	90	87	90	90	87	92	90	91	86 / 366	87 / 183	83 / 91·5	428..86·7
570	91	91	87	91	81	91	89	84	91	90	91	91	95	91	91	92	88	86 / 366	91 / 183	90 / 91·5	570..89·6
750	91	88	86	88	91	88	86	87	88	91	88	92	94	88	93	94	90	93 / 366	88 / 183	92 / 91·5	570..89·6

In Table 17, the effect of swift speed on the percentage fibre in the shoddy has been considered for various pulling considerations, viz. feed roller speed, setting and diameter, population of swift, position of the bit box slide, bit roller setting and, finally, for varying rates of production. The mean figures for percentage fibre in the shoddies pulled under the swift speeds of 428, 570 and 750 r.p.m., have been given in the final column and it will be observed that under these three swift speeds these were respectively 86·7, 89·6 and 89·8%. It would seem, therefore, that for this particular type of rag one will obtain slightly less thread when the swift speed is raised from 428 to 570 r.p.m., but a further increase to 750 r.p.m. has little or no effect on the composition of the shoddy.

Considering the effect of changing the swift speed on the seven variables, i.e. feed roller speed, feed roller setting, etc., then it would seem that the greatest effect is obtained by feed roller speed, feed roller setting and rate of production. As shown in Table 17, whereas the mean figure for the percentage fibre for the three feed roller settings for the swift speed of 428 r.p.m. was 81%, the mean figure for 570 r.p.m. was 90%. Similarly, if one takes the corresponding averages for the rate of production it will at once be observed that the figure for the 428 r.p.m. was 85% and 92% for the 750 r.p.m. A similar difference was produced in the case of feed roller settings. At this stage it is interesting to observe that increasing the swift speed for the same population of swift —and, indeed, for different densities of pinning—did not appear to bring about any significant change in the fibre content of the shoddy.

Control of Thyratron Valves for Variable-Speed D.C. Motors

Thyratron control by D.C. grid voltage, control by varying an A.C. grid voltage or by phase shift of A.C. grid voltage are some of the points dealt with, also phase shift with three-phase rectification and automatic speed control

By "ENGINEER-IN-CHARGE"

THE speed at which a direct-current motor runs on a given load, or armature current I_A, is proportional to $\frac{V - I_A R_A}{\Phi}$, where V is the voltage applied to the armature, R_A the resistance of the armature, and Φ the magnetic strength of the field magnets. It follows that the speed of the motor can be altered by altering the voltage applied to the armature, or by altering the value of the current flowing through the field windings to alter the field strength, or by a combination of the two methods.

Electronic methods can be used to run a d.c. motor at various speeds, and/or to maintain the speed within given limits on varying load or supply voltage. This may be done by using one or more controlled electronic valves to supply the electrical power to the motor, and/or by employing electronic apparatus to apply corrective action in a conventional motor circuit.

Small and medium sized d.c. motors may be fed from a.c. supply mains through one or more gas-filled triode valves (thyratrons), the d.c. output of which can be varied as required by slight variation of voltage applied to the control grid of the valve. Various circuits may be used for control of the grid voltage, as described below. In the following description the modern concept of an electric current as a flow of negatively-charged electrons from a point of lower to a point of higher potential, or from negative to positive, has been adopted.

Fig. 1a shows a simple circuit in which a thyratron valve is used to feed a load circuit from a single-phase a.c. supply. The electrical heating circuit for the filament F is not shown. Assuming first that no voltage is applied between the cathode C and the grid G, electrons will pass through the valve from cathode C to anode A, and through the load circuit, during almost the whole of the half cycles of the a.c. supply when the anode is positive to the cathode, i.e. when X is positive to Y. No current will flow in the anode and load circuit during the half cycles when Y is positive to X. Thus the valve acts as a half-wave a.c. to d.c. rectifier.

Thyratron Control by D.C. Grid Voltage

The electron flow through the thyratron and load circuit can, however, be controlled by applying a suitable voltage between the cathode C and the grid G. Fig. 1a shows how a potentiometer P can be used to control this grid bias voltage. If a negative voltage is applied to the grid electron flow through the thyratron will not commence until the anode voltage has reached a higher value than would be the case if no such voltage was applied to the grid. Fig. 1b shows the relationship between the critical grid voltage and the anode voltage during a positive half cycle of the a.c. supply. With a negative grid bias voltage O — d_1 no current will flow in the anode circuit until the anode voltage has reached the value O — d. With a negative grid bias O — a_1 no current will flow until the anode voltage has reached the value O — a, and so on. In Fig. 1c the curve d_1 c_1 b_1 a_1 has been plotted to show the critical grid voltage for various values of anode voltage during a positive half cycle. For a given anode voltage no anode current will flow unless the grid is less negative than the critical grid voltage. In most valves the slope of the curve in Fig. 1b will be steeper than shown, in which case the amplitude of the critical grid voltage curve will be correspondingly reduced.

As the anode voltage rises from

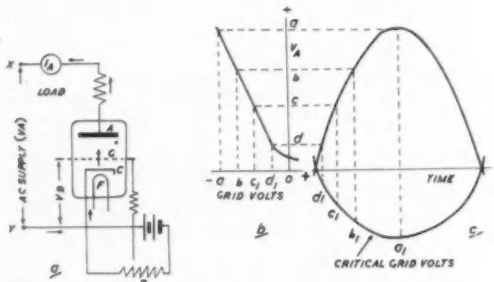


Fig. 1. Application of grid control curve to half a cycle of A.C. anode voltage

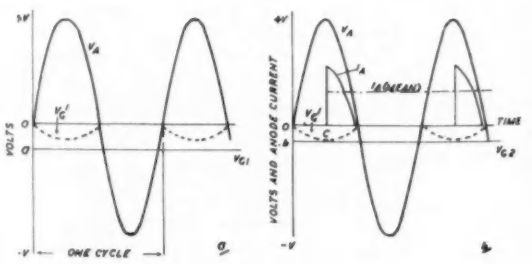


Fig. 2. Output control by means of D.C. grid bias

zero in the positive half cycles electronic emission through the valve can only commence when the grid voltage is less negative than the critical value. Thus if the grid is maintained at a negative voltage V_{G1} which is greater than the maximum value of the critical grid voltage V'_G, as indicated in Fig. 2a, the valve will be non-conducting during the whole of the positive half cycles, as well as during the negative half cycles, and the load current will be zero. If the grid is maintained at a negative voltage V_{G2} which is equal to the maximum value of the critical grid voltage V'_G, as indicated in Fig. 2b, the valve will not start to conduct until the a.c. voltage has reached its maximum value. Thus anode current I_A will only flow during the latter half of each positive half cycle as shown. The mean value of I_A over the positive half cycles will then be as shown by the chain dotted line.

It must be understood that once electronic emission in a thyratron has commenced, and ionization of the gas filling has occurred, conduction cannot be prevented by any alteration of the grid voltage, until the anode voltage has fallen below the ionization value of the gas, which may be in the region of 10 volts. Thus, once anode current has commenced to flow, this will continue practically to the end of the positive half cycle, and will then cease if the negative grid volts are sufficiently increased. It may be noted that a slight anode voltage is actually required for electronic emission with zero grid voltage. If the grid voltage V_G is maintained at a slightly less negative value than the peak critical grid voltage V'_G, electronic emission will commence during the first half of the positive half cycles, giving a higher mean value of anode current, and consequently a higher mean value of the voltage applied to the load circuit. Thus by means of grid voltage the speed of a motor armature which is connected in the anode circuit can be simply controlled. The method indicated in Fig. 1a can be used to cut off the load current or to control it between maximum and half maximum value but, since it cannot exercise control during the latter halves of the positive half cycles, the output cannot be controlled between zero and half maximum value.

Control by Varying an A.C. Grid Voltage

The output of a thyratron valve may be controlled by means of a variable d.c. grid voltage, a variable a.c. grid voltage, or variation of a combined d.c. and a.c. grid voltage. A.c. voltage can be applied between the cathode and grid from a.c. mains through a potentiometer or transformer. Fig. 3a shows a simple circuit in which a variable grid voltage is obtained from the tapped secondary winding of the grid transformer T. In Fig. 3b the sine curve V_A represents the a.c. voltage applied between the cathode C and anode A through the load circuit, whilst the curves V'_G represent the critical grid voltage for the valve in question. The a.c. grid voltage is, in this case, arranged to lead the anode voltage by more than half a cycle.

If the transformer is adjusted to apply the grid voltage indicated by the curve V_{G1} conduction through the valve will commence at the instant T_1 and continue through the rest of the positive half cycle, giving a high mean anode current and a high mean voltage applied to the load which is connected in the anode circuit. With the grid voltage V_{G2} conduction will commence at the instant T_2, whilst if the grid voltage is raised to the value indicated by the curve V_{G3} conduction will not commence until the instant T_3, giving a comparatively low average value of anode current and load circuit voltage.

Since, by adopting a suitable a.c. grid voltage, the curve of grid voltage can thus be made to cut the curve of critical voltage at any point in the first seven-eighths of the positive half cycles, control by variation of an a.c. grid voltage of fixed phase relationship to the anode voltage enables the output current to be varied almost from zero to maximum value. The smaller the phase difference between the applied grid voltage and the critical grid voltage the lower is the minimum value of the current, a phase difference being necessary to ensure that the valve does not commence to conduct at the start of each positive half cycle. The greater the difference between the slopes of the applied grid voltage wave and the critical grid voltage curve at the point of firing of the valve and more precise is the timing and control. The vertical shift method of control by applying to the grid an a.c. voltage in conjunction with a variable d.c. voltage was described in the article, "Use of Gas-filled Triode Valves to Supply Fractional H.P. Variable-Speed D.C. Motors," in the January, 1957, issue of T.M.

Control by Phase Shift of A.C. Grid Voltage

Another common method of controlling the output is by applying

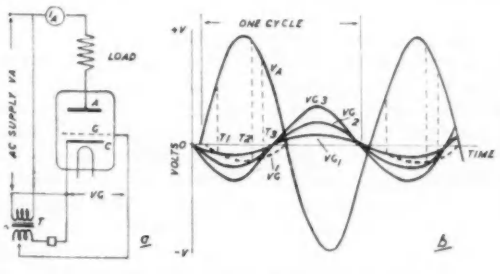


Fig. 3 (above). Output control by means of variable A.C. grid voltage of fixed phase

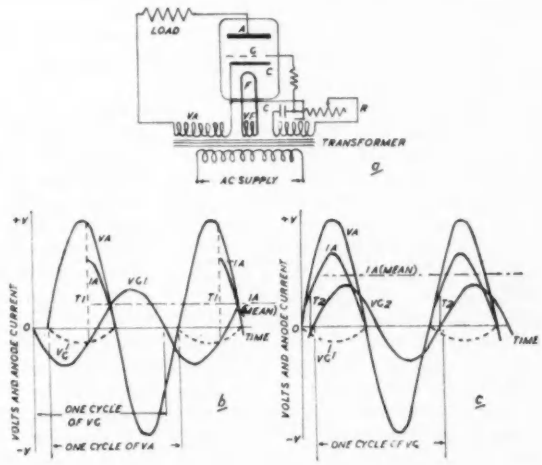


Fig. 4 (right). Output control by phase shifting of grid voltage

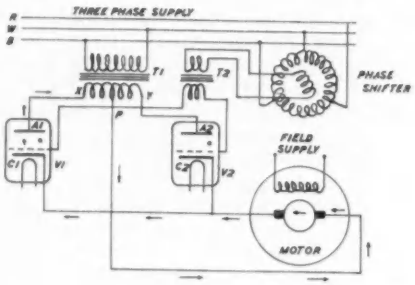


Fig. 5 (above). Two thyratron valves arranged as a full-wave rectifier to supply a motor armature

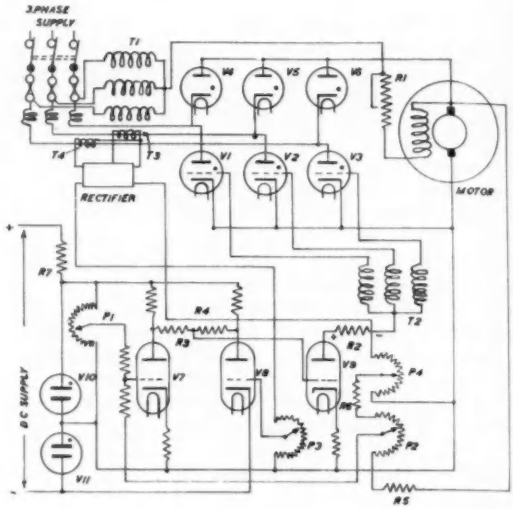


Fig. 6 (right). Simplified diagram of a speed control circuit employing phase shift of grid voltage

between the cathode and grid an a.c. voltage of fixed virtual or effective value and varying the phase relationship between this grid voltage and the anode voltage, this being known as horizontal shift control. The principle is indicated in Fig. 4. The capacitor C and the variable resistor R in Fig. 4a form a phase-shift circuit by means of which the phase difference between the grid voltage and the anode voltage can be altered at will.

Fig. 4b indicates the conditions when the applied grid voltage V_{G_1} is five-eighths of a cycle out of phase with the anode voltage V_A. The curve of applied grid voltage intercepts the critical grid voltage curve V'_G at the instant T_1, so that firing of the thyratron will commence at that instant and continue during the rest of each positive half cycle of the anode voltage. The average value of the anode current I_A during the positive half cycles will be as indicated by the chain dotted line. Fig. 4c indicates the conditions when the phase of the applied grid voltage V_{G_2} is advanced so that it is only one-eighth of a cycle out of phase with the anode voltage V_A. The valve will then commence firing at an earlier instant T_2 in the positive half cycles so that anode current I_A will flow during nearly the whole of these half cycles, resulting in almost the maximum value of mean anode current. As a result the average voltage applied to a motor armature in the anode circuit will then have a relatively high value to run the motor at high speed. A high value of grid voltage gives the most clearly defined firing point because there is then a considerable difference between the slope of the curves of applied grid volts V_G and critical grid volts V'_G. This promotes stable operation since the effect of slight changes of physical conditions, such as temperature, on the control circuit will then have little or no effect on the striking point of the valve. The voltage applied to the grid may consist of an a.c. voltage of varying phase in series with a fixed d.c. voltage bias in some cases.

Full-Wave Rectification

Fig. 5 shows the simplified diagram of connections of a circuit in which two thyratrons are arranged to provide full-wave rectification to feed the armature of a d.c. motor from a single-phase supply derived from a three-phase system. The control grids are connected to the ends of the secondary winding of the grid transformer T_2 so that at all times one grid is positive whilst the other is negative, in the same way as the corresponding anodes. The cathode heater circuits have not been shown on this diagram. The phase relationship of the applied grid voltage to the anode voltage is governed by means of the inductive phase shifter. This has a distributed stator winding fed from the a.c. supply and a single-phase rotor winding used to supply the primary winding of the grid transformer T_2. Phase shifting of the grid voltage is effected by merely turning the rotor of the phase shifter through a small angle.

During the half cycles of the a.c. supply in which the end X of the anode transformer T_1 is positive to Y electrons can flow in the direction indicated by the arrows after the applied grid voltage has fallen to a less negative value than the critical grid voltage. During the half cycles of the a.c. supply in which the end Y of the anode transformer is positive to X, and after the applied grid voltage has fallen to a less negative value than the critical grid voltage, electrons will pass from the cathode C_2 to the anode A_2 of the valve V_2 and through the transformer secondary winding from Y to P, passing through the motor armature in the same direction as during the other half cycles when the valve V_1 was conducting. The field windings of the motor are fed at constant voltage through another rectifier, which is not shown, and the motor speed controlled by variation of phase of the applied grid voltage effected by turning the rotor of the phase shifter.

Phase Shift with Three-Phase Rectification

Fig. 6 shows a simplified circuit which may be used to supply a variable-speed d.c. motor of about $7\frac{1}{2}$ to 40 h.p. The motor armature is fed through the valves V_1 to V_6 which are bridge-connected to give full-wave rectification. The valves V_1 V_2 and V_3 are grid-controlled thyratrons, but the gas-filled valves V_4 V_5 and V_6 are uncontrolled. The latter valves also supply direct-current to the field windings by rectifying the output of the transformer T_1.

The motor speed is controlled by means of the potentiometer P_1. When set in its bottom position for zero speed the valve V_7 becomes practically non-conducting, under which conditions the potential (voltage) applied to the grid of the valve V_9 is the mean of the anode potentials of V_7 (approximately +150 V) and V_8. This gives the grid of the valve V_9 a positive

potential so that this valve is fully conducting. The anode voltage of V_9 and the negative voltage bias across the resistor R_2 are applied to the neutral point of the secondary windings T_2 of the thyratron grid transformer. The primary windings of this transformer are not shown on the diagram. Due to the fact that this gives the thyratron grids a negative bias the thyratrons V_1 V_2 and V_3 will then be non-conducting, and no voltage will be applied to the motor armature.

If the potentiometer moving contact is turned in a clockwise direction at P_1 a positive voltage is applied to the grid of V_7 and the valve conducts. This reduces the anode potential of this valve. In consequence the grid potential of V_9 is reduced since this depends on the resultant mean voltage at the junction of the resistors R_3 and R_4. The conduction through V_9 is reduced and the potential of the neutral point of the secondary windings T_2 of the thyratron grid transformer is raised. The thyratrons V_1 V_2 and V_3 then conduct and d.c. voltage is applied to the motor armature to raise its speed. A portion of the armature voltage is applied through the resistors R_5 and R_6 and the potentiometer P_2 and opposes the voltage from P_1. Balance is reached when the two voltages are practically equal and the motor then runs at a steady speed.

The valves V_{10} and V_{11} operate as stabilisers. In the event of rise of the d.c. anode voltage above the required value, due to any cause, electronic discharge occurs through these valves and through the resistor R_7. The volt drop across R_7 then reduces the anode voltage in the phase-shift control circuit. These valves cease to conduct when the voltage has fallen to the required value again. In the event of increase of load on the motor the armature current I_A will rise, and the $I_A R_A$ volt drop in the armature will tend to reduce the motor speed slightly. However the consequently increased current through the current transformers T_3 and T_4, applied through the rectifier, will then alter the potential of T_2. By loading T_3 and T_4 with suitable resistors an a.c. voltage which is proportional to the armature current I_A is produced. The rectified voltage is applied to the potentiometers P_3 and P_4 in series and, by suitable setting of P_4, a positive bias can be added to the negative feed-back from the armature. In this way the voltage applied to the armature can be slightly increased automatically on increased load, to compensate for the volt drop in the armature and maintain the speed at the required value on varying load.

The potentiometer P_3 can also be set so that, in the event of overload on the motor, the grid voltage on the valve V_8 is altered to reduce the conduction through this valve. This raises the potential at the junction of R_3 and R_4, with increased conduction through the valve V_9. As a result the potential of the neutral point of T_2 is altered to reduce the conduction through the thyratrons V_1 V_2 and V_3. As a result the motor will come to rest with a limited current flowing through its armature.

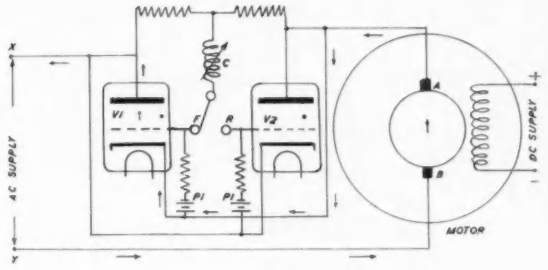


Fig. 7. Use of two thyratrons to supply a variable-speed reversing D.C. motor

Automatic Speed Control

For many variable-speed drives it is merely required that the speed shall be capable of adjustment as required by means of a control knob, and that the speed shall then remain reasonably constant on a given setting of the speed regulator. There are, however, other drives for which it is required that the speed shall be automatically controlled in response to changes of speed of other machines, or changes of some physical condition. For instance it may be required that the speed of a reel be progressively reduced as the material is built up on the reel. This may be accomplished by coupling the speed-control potentiometer to a pivoted arm having a roller which rides on the periphery of the reel.

Another method of controlling the speed of rollers is to couple the rollers to a tacho-generator which generates a voltage proportional to the speed of the rollers. This voltage is electrically compared with a reference voltage so that any deviation from the required speed results in a difference of voltage, or error voltage, which is applied to the electronic circuit to control the motor speed, so that the speed is corrected. The reference voltage may be created electrically by some other machine with which the controlled rollers are required to run in conjunction.

Reversible Drives

Fig. 7 shows a simplified circuit in which two thyratrons are used to give half-wave rectification to the armature of a d.c. motor. A constant field current is supplied through a rectifier which is not shown on the diagram. When the two-way switch is placed on the contact F, as shown, the negative bias on the grid of the valve V_2 prevents this conducting during the positive halves of the a.c. anode voltage cycle, and, of course, the valve does not conduct during the half cycles when the anode voltage is negative to the cathode. However the valve V_1 conducts during the half cycles in which X is positive to Y, electrons then passing through this valve, and through the motor armature from B to A, as indicated by the arrows. The speed is controlled by varying the grid voltage in some way, as by means of the variable choke C, which may be a saturable reactor.

When the two-way switch is placed on the contact R the negative bias from P_1 prevents the valve V_1 from conducting. During the half cycles in which Y is positive to X the valve V_2 then conducts, under the control of the grid bias voltage from C. The electrons then pass from X to the cathode of V_2, through V_2 from cathode to anode, through the motor armature from A to B, and so on to the terminal Y. In this way the armature current and motor rotation are reversed by means of the two-way switch.

New Finish for Furnishings

A range of fabrics for curtains and loose covers with an entirely new finish which will give the consumer many valuable advantages in one fabric is announced by Courtaulds Ltd. The finish was developed at the company's research laboratory at Bocking. "Fibro" viscose rayon staple is used for the production of the fabrics. "Fibro" fabrics with the new finish, it is claimed, are safe and easy to wash. They remain stable in size and shape and resist stains and dirt. They drape and handle better and are being produced in a range of designs and colours and should reach the shops in February.

Some Aspects of Fibre Motion in a Woollen Card

PREVIOUSLY published results had shown that a slow-moving doffer or worker did not take up all the fibres presented to it by the fast-moving swift. As a result of this a reservoir of fibres was built up on the swift and workers and an example could be a swift (60 r.p.m.) with 21 drams of fibre and each of four workers (4 r.p.m.) with 11 drams of fibre for a production rate of about 2 drams per sec. (30 lb./hr.), said Mr. R. T. D. Richards (Wool Industries Research Association) in a recent address to Dewsbury Textile Society. For a 60 ins. wide machine the above loading on a swift covered with 90/9 card clothing would yield about the same number of fibres of a 64s quality blend (mean fibre length of about 1 in.) as the three million points of card clothing.

An equivalent way of considering the problem was to note the average time a fibre spent in a single swift part excluding the time spent on the underside of the doffer. For the above example this time was 30 secs. and was called the mean delay factor. It was an average value only and whereas some fibres would spend only about ½ sec. in the part some other might spend 300 secs. or more on it. The mean delay factor gave a measure of the time necessary for a part (*a*) to "run-off" prior to fettling it or (*b*) to run on to waste bobbins when a blend of dark shade followed on one of a light shade. The value of the factor determined the shape of the response at the output end of a single swift part for a sudden change at the input end. Further, the work could be extended to include any number of swifts. The greater the value of the factor the more gradual was the change at the output end. This gradual change was analogous to the delay in a thermometer when recording the temperature of its surroundings.

A survey was made of some hopper tests which confirmed theoretical deduction made with the use of the mean delay factor and it seemed that reliability in a hopper to deliver fibres such that the average of ten or so consecutive weighs would remain practically constant for all conditions was more important than the absolute accuracy of each weigh. In one of the tests on the W.I.R.A. Continental type card no change of shade could be detected along the slubbings when successive pairs of hopper weighs were made to contain blue fibres and then white fibres only. This emphasised that the factor was also a guide as to the degree of colour mixing etc., that could take place within carding parts.

In a further test the variation between 5 ft. lengths of Scotch feed was compared for three conditions of (a) normal hopper feed lattice and roller speeds, (b) as in (a) but with faster spiked lattice speed with a non-weighing hopper and (c) as in (b) but with feed lattice and roller speeds forty times as fast. The variation with conditions (b) were about twice those in (a) and with conditions (c) twice those in (b). Even with conditions (c) much of the irregularity would have been smoothed out had the sliver been allowed to pass through the later parts of the machine.

In industry a few hopper pans were skewed through a comparatively small angle. In view of the influence of the mean delay factor it would seem necessary to have a larger angle (e.g. that produced by a 72 ins. wide hopper placed across a 60 ins. wide card) to achieve some useful reduction in irregularities of feed.

In some woollen mills a few of the workers were run with a reversed direction of rotation and even if the density of fibres on the workers remained unchanged the mean delay factor of the part would be reduced.

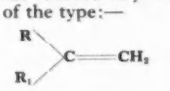
Slow strippers were used sometimes and in one test at Torridon three stripper speeds were tried on the carder part only of the Continental type set. The factor values were estimated at 36, 40 and 40 secs. corresponding to stripper speeds of 8, 14 and 175 r.p.m. respectively and this confirmed the theoretical estimate that the effect of stripper speed would be small. After examination of the yarns and slubbings no definite evidence was found in favour of any one speed.

Two fancies working on one swift had been used at various times for many years and undoubtedly such a modification did influence the value of the mean delay factor of the part. One report mentioned that the loading on the three workers following a second fancy was 2½ times greater than for the case with one fancy.

Use of the factor had enabled possible control loops on a card to be assessed without undertaking large scale expensive tests. An example of such a loop would involve measuring at a Scotch feed and attempting to control the tape (or ring) doffer speed in relation to the variation but it could be shown that this was not very practicable. The factor was very useful during the later stages of the development of the "Autocount." Work was proceeding with the estimates of the factor values for various conditions and preliminary results showed that the doffer speed was important in determining the value of the factor.

Anti-Static Treatment for Textiles

A PROCESS is described in B.P. 769,014 in which synthetic materials, in particular those that are hydrophobic, are impregnated with an antistatic agent which is fast to washing and dry-cleaning. The agent is a solution of a polymer of an unsaturated monobasic acid, e.g. acrylic or methacrylic acid, or a copolymer, containing free carboxyl groups, of one or more unsaturated monobasic or dibasic acids or a dibasic acid anhydride, e.g. acrylic, fumaric and maleic, respectively, with one or more vinyl or vinylidene compounds of the type:—



where R, R^1 are hydrogen, or aryl, alkyl, alkaryl, alkoxy, acyloxy, carboxy or alkoxy-carbonyl groups or halogen atoms, the preferred monomers being esters of vinyl alcohol, acrylic acid and, in particular, a vinyl alkyl ether if the material to be treated is a textile, together with one or more polymeric polyhydric alcohols, e.g. a polyglycerol having not less than three ether oxygen groups per molecule. The treated material is preferably dried with hot air and treated at temperatures up to 200°C. for 30 secs. or longer to bring about the reaction between the polymer, or copolymer, and the polyhydric alcohol; a $ZnCl_2$ catalyst may be incorporated in the solution.

Distinctive Coating and Suiting Cloths

The patterns reproduced approximately 5/6ths. size, linear, on the facing page are selected from the range of high quality cloths manufactured by George Roberts and Co. Ltd., Selkirk, Scotland. Brief details are as follows:—

(1) F2071. Beautifully blanced weave and subtle colouring characterise this alternate striped 17/18 ozs. Cheviot suiting.

(2) F2005. In royal blue, white and middle grey, this 13 ozs. lightweight Saxony worsted commands immediate attention.

(3) F2399. In black and white this 15/16 ozs. lambswool top coating or sports coating is quietly overchecked in royal blue.

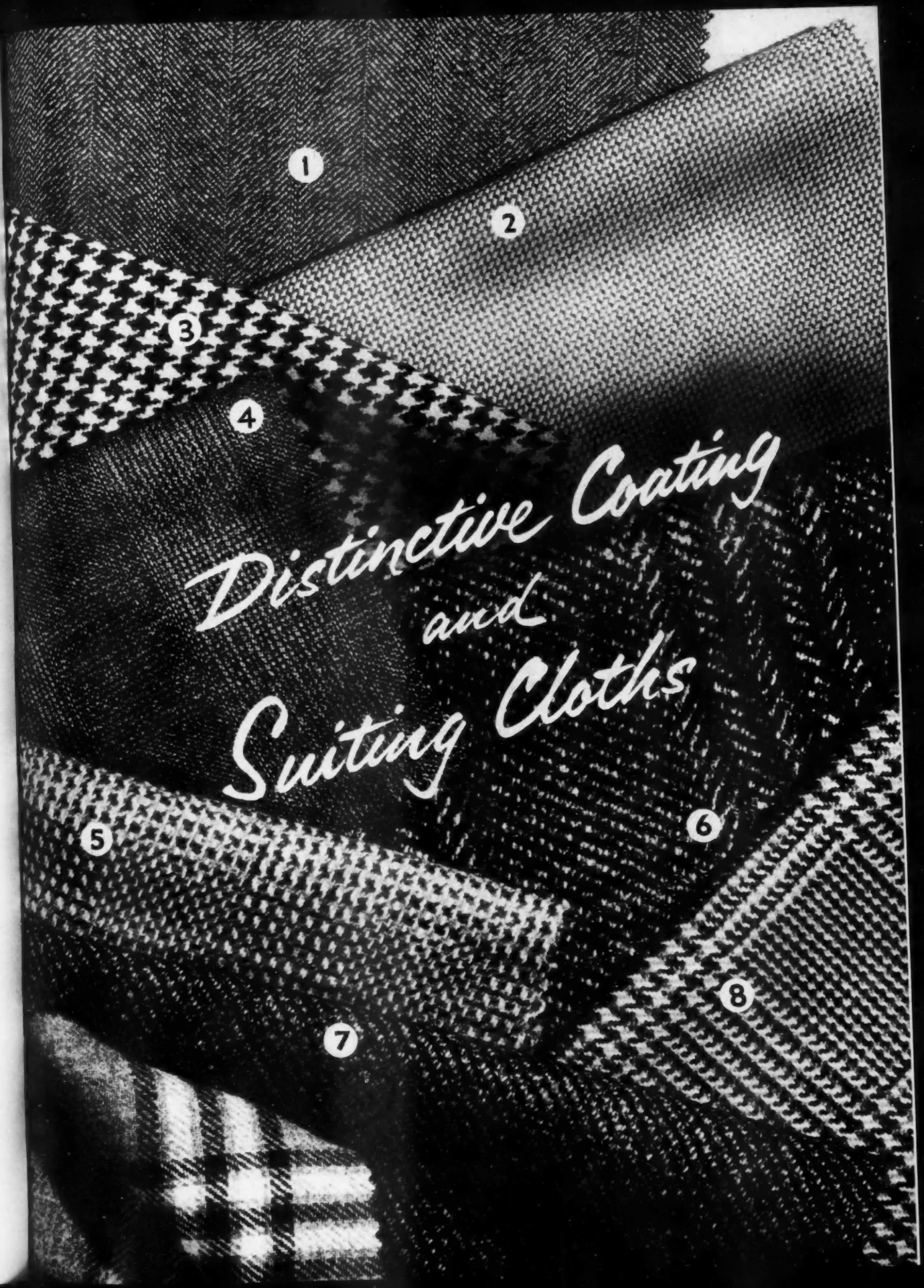
(4) F209. A sparkling checked 17 ozs. twist Saxony with decoration.

(5) F2426. Checked 11/12 ozs. lambswool sports coating in heather, middle grey, white and crimson.

(6) F2508. A fine 25/26 ozs. winter overcoating with a lovely colour combination of black, grey, heather, white, royal blue and russet toned yarns.

(7) F2629. A distinguished 22 ozs. check-back overcoating in mingled grey and black.

(8) F2408. Green, fawn, russet, brown and white yarns are employed to full advantage in this 16/17 ozs. lambswool topcoating.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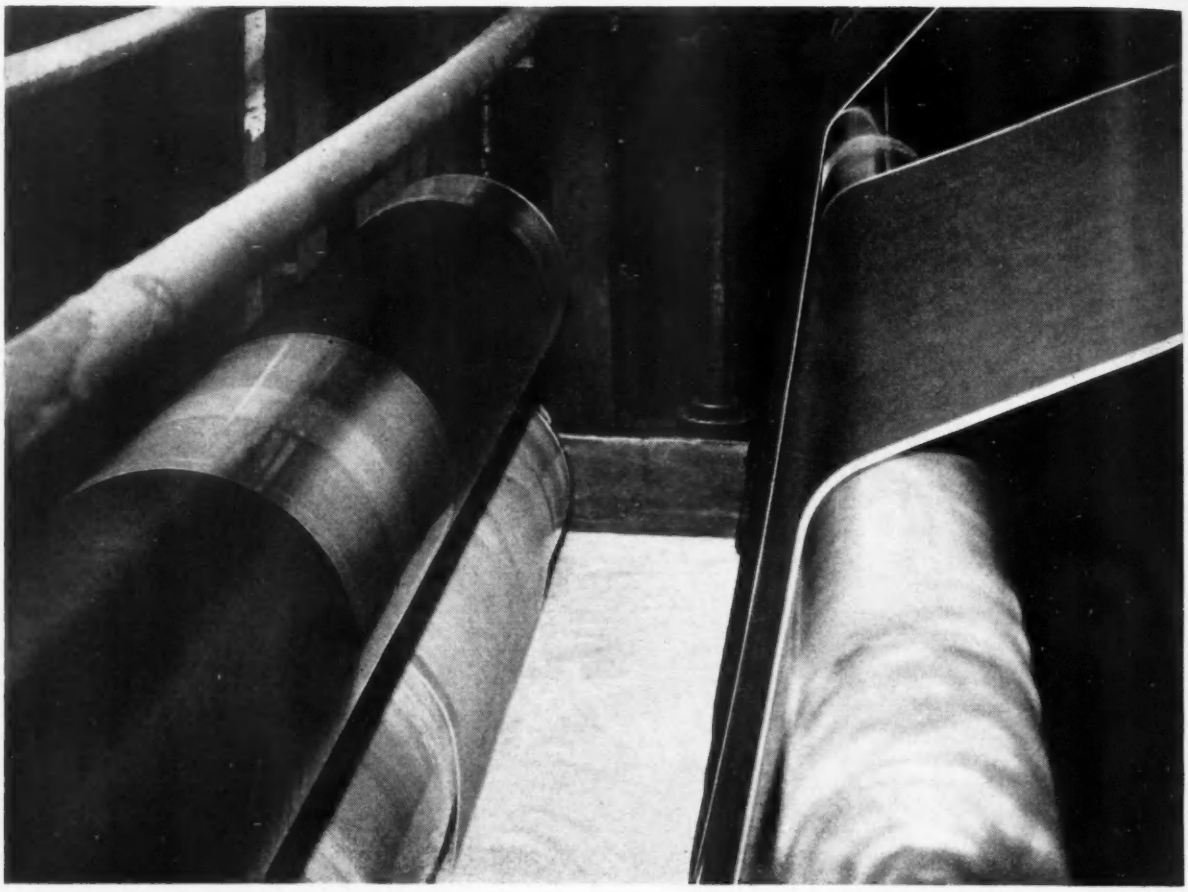

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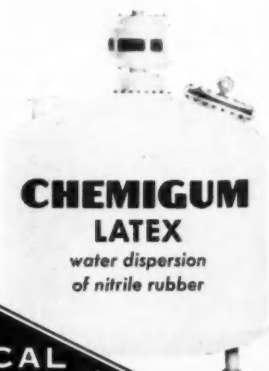

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Some Aspects of Modern Warp Sizing*

With the dry-feed attachment to the "Shirley" automatic size box, the adhesive is merely put into a container and the lubricant into a small tank associated with the box. From this preliminary stage everything is then automatically performed

By H. HACKING, A.M.C.T.†

THIS article is concerned with sizing cotton yarns and yarns spun from rayon or synthetic fibres, or mixtures of these. It does not deal with the sizing of continuous filament yarns and the subject matter is divided into the following five sections:—

(1) An examination of the control of size percentage exercised at present in normal Lancashire tape-rooms.
(2) Control of sizing by means of the "Shirley" automatic size box, including use of slurries and the dry-feed attachment.
(3) A brief comparison of the "Shirley" box with other modern control methods.
(4) Sizing materials.
(5) Brief comments on high-production tape-frames.

Conventional Non-Automatic Control of Size Percentage

With conventional non-automatic methods, accurate control is impossible due to the factors which influence the amount of size put on the yarn. These factors are difficult to assess accurately when specifying a size mixing to give a pre-determined percentage of size on the yarn. Normally at a mill, mixings are used which have been found by experience to give reasonably good weaving. Attempts at control are sometimes made based upon observations such as the "feel" of the yarn, the weights of sized beams, and the readings obtained by a starch refractometer. As considered necessary, the size in the beck or sow-box, or in both, may be strengthened or weakened to try and obtain the desired result. From a complete understanding of the problem, it is no surprise to the Shirley Institute to find that on the whole the control of size percentage in the mill is much inferior to the high standard to which it is supposed to conform. This statement is in no way a criticism of traditional tape-sizing skill but is due to the known difficulties associated with the control of sizing.

The results of analyses made at the Institute of samples of sized yarn from eight different mills appear in Table 1. The samples were all obtained recently, chiefly under normal mill conditions in connection with investigations made by Shirley Institute in the firms concerned. In only two instances was the problem connected with the effect of sizing on the warp breakage rate, while in the remaining six instances the results relate to sizing conditions which were not considered by the mill management to be unsatisfactory as far as warp breaks were concerned. At two mills, samples were obtained from a tape-frame equipped with a "Shirley" box and a tape-frame with a normal box, and in these two cases direct comparison is possible.

Table 1

Mill	Yarn	Percentage size on yarn necessary to give good weaving (except mill C)	Type of Sow-box	Percentage of size on yarn (by analysis)
A ..	12s. Am.	10	Non-auto	15·3 - 22·2
B ..	15s. - 30s. Am.	8 - 10	Non-auto	8·6 - 15·2
C ..	15s. - 28s. Am.	18 - 19	Non-auto	10·7 - 18·3
D ..	32s. Eg.	(a) 13	Non-auto	18·2 (single warp)
		(b) 14½	"Shirley"	14·0 (single wrap)
E ..	36s. Eg.	14	Non-auto	23·7 - 26·0
F ..	62s. Eg.	(a) 12	Non-auto	13·1 - 14·8
		(b) 14	Non-auto	17·8 - 20·0
G ..	70s. Eg.	(a) 12	Non-auto	9·6 - 15·0
		(b) 15	"Shirley"	14·4 - 16·3
H ..	32s. Am. beam-dyed	5 - 6	Non-auto	7·5 - 10·0

Notes. (1) Mill C. It was desired to obtain a given piece weight of cloth. Hence the 18 - 19% size target.
(2) Mill D. The different percentages aimed at were due to differences in yarn hairiness between yarns from separate spinners.
(3) Mill G. A special investigation involving the "Shirley" box is referred to here.
(4) Mill H. These "wet" backbeams were pre-dried by passing round a small cylinder before entering the size.

It is clearly indicated that the general tendency with non-automatic sizing is to add more size than necessary and it is noteworthy that in one instance the excess is as great as 12% size on yarn (i.e. 26% against the required 14%). On the other hand, at Mill C, the failure to maintain the percentage at the desired level of 18–19% would give piece weights lower than required. The results for Mills D and G, comparing both types of boxes indicate the marked superiority of the "Shirley" box. The data contains only one reference to

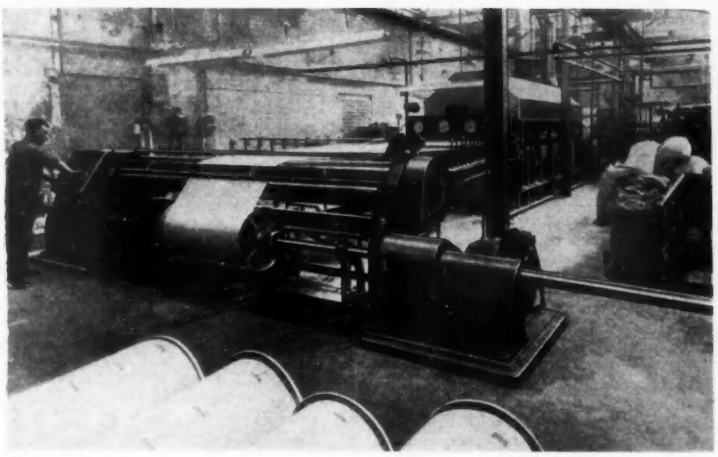


Fig. 1. General view of frame

* *From a recent paper to Burnley Textile Society.*

† *Senior Technical Officer, Weaving Dept., British Cotton Industry Research Association.*

beam-dyed yarn (Mill H) and this is included because the results were obtained very recently, when the other figures were being collected.

Considering the sizing of beam-dyed yarn in general, it is doubtful whether anyone would dispute the statement that control is, on the whole, notoriously poor, due to the difficulty in making a satisfactory allowance for the diluting effect on the size of the water in the backbeams. The difficulty is further complicated by the fact that the water in the backbeams may vary in quantity from set to set and from the start to end of any individual set. Partial pre-drying of the yarn minimises the difficulty but by no means completely eliminates it.

Results of Detailed Tests in a Mill

To illustrate these remarks some results appear in Table 2 which were

Table 2

Frame	Concentration of size in sow-box, oven-dry solids, per cent.	Percentage size on yarn (by analysis)
	10·8	15·8
A	9·9	12·3
	7·7	12·3
B	7·7	14·4
	7·3	11·5
C	7·2	14·8
	6·2	9·7

obtained recently in a tape-room containing several frames. Tests were made over several days on three frames all being fed with nominally identical size (chiefly starch and tallow) from their respective becks. A uniform 10% size on yarn was aimed at throughout the time the tests were being made.

Taking the results as a whole it will be observed that the concentration of size in the sow-box varies considerably from time to time. The two main reasons for this are (*a*) variations in the strength of the size being fed from the becks and (*b*) differences between the frames as regards the amount of condensate (from the open steam pipes), necessary to keep the size hot in the respective sow-boxes. This last point was discovered from test results not included in the figures above but obtained concurrently with them. It is clear that the size concentration has affected the amount of size put on the yarn, as is well understood from first principles of sizing control, but it is also obvious that other factors have been important. For example, a given concentration tends to put less size on the yarn with frame A than with the other two frames. Thus there are frame to frame differences independent of the control of concentration of the size. In addition, local day to day conditions associated with the sizing of rather different sheets of threads have contributed to the apparent inconsistencies of the results for the tape-frames taken separately, a good example being the fact that with frame A, concentrations of 9·9% and 7·7% at different times both put the same amount of size on the yarn.

In the face of results such as these it is reasonable to ask: "What can be done to give good control?" The short answer is that to obtain good control with conventional sow-boxes by accurate calculations—what might be termed a "slide-rule" technique—plus instrumentation of the limited kind generally available, would be very difficult, if not well-nigh impossible. The writer can vouch for this from many years' sizing experience both at Shirley Institute and in a considerable number of mills. If it is suggested that the particular conclusions quoted above do not apply to every mill, this point is conceded but it is pointed out that there will probably be other factors at work causing variation. Not many mills have such a limited range of sizing conditions as the one to which the figures refer. Despite the nominally satisfactory sizing which many manufacturers would claim for the old methods, control must of necessity be imperfect and, despite warp breakage rates for some cloths not being sensitive to small changes in percentage of size, warp breakages must inevitably be more frequent than the minimum possible.

"Shirley" Automatic Size Box

The principles by which this works have been widely publicised but it may be as well to reiterate them briefly.

(1) A stock size of known concentration is fed from the beck and passed through a specially-designed metering pump before entering the size-box.

(2) The speed of working of the metering pump is controlled by two P.I.V. gear settings, one based on the weight of the warp sheet being sized and the other indicating the size percentage required. The size passing through the pump contains the weight of solid matter it is desired to put on the yarn.

(3) As the stock size is pre-arranged to be of higher concentration than necessary for the percentage size to be aimed at (i.e., the correct weight of solids is associated with too small a volume of water to balance the pick-up of paste by the yarn) the level of size in the box tends to fall. A level control device detects any very small change and periodically operates a water supply to maintain the level constant.

(4) As the volume of size in the box remains constant, and as the correct weight of solids is being pumped in, the percentage of size being aimed at must inevitably be put on the yarn. Any error in size percentage due to an incorrect start, after gaiting a new set, or first thing in the morning, is very quickly adjusted automatically. To allow this quick adjustment the capacity of the box is only 12–13 gallons.

Mechanical Performance of the "Shirley" Box

The earliest models of the "Shirley" box, while in general functioning fairly well, demonstrated in use that there were points where improvements in design could be made. A number of detailed changes have in fact been made and these are all incorporated in the latest models. The improvements aim at making the automatic box easier to use whilst ensuring that it is as foolproof in performance as can possibly be devised. A few boxes of the latest type have now been in service for a year or more and have given every satisfaction. However, to be quite fair in this matter it must be pointed out that with all "Shirley" boxes, some attention to, or replacement of, a part will occasionally be necessary. Mention should specifically be made of the diaphragm, which cannot be expected to last more than about two years. This limited attention to servicing and replacements offers no discouragement to the manufacturer who is conscious of the large benefits he has obtained. Which motorist would complain if it were necessary for his car to be "de-coked" after serving him faithfully for 30,000 miles!

Financial Implications

To purchase an automatic box demands a capital outlay which must be justified by the results obtained. *An improvement in the weaving quality of the warps owing to more satisfactory sizing would seem in itself to give ample justification*, but as reliable data on variations in the amount of size added to the yarn and the corresponding effect on warp breaks is lacking at most mills, it is useful to consider possible direct savings in sizing costs. The data in Table 2 confirms that with a normal size-box oversizing is common. This is not surprising in view of the general lack of

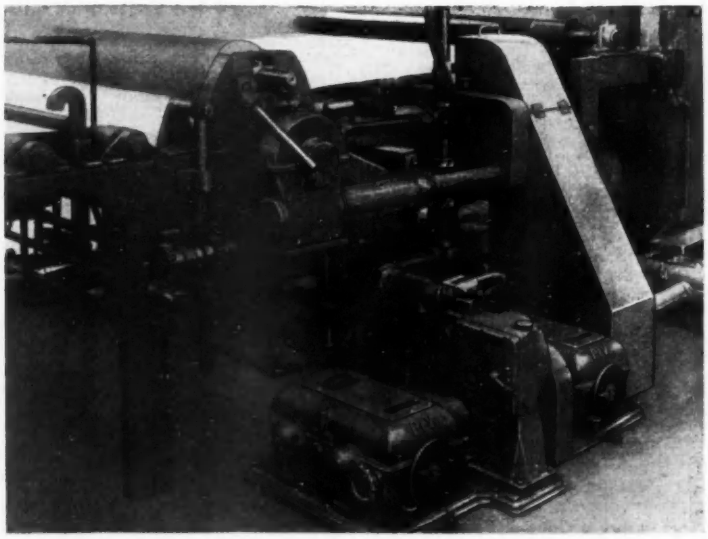


Fig. 2. View of "Shirley" box showing metering pump and P.I.V. gears

control and the difficulties caused in weaving when a warp is undersized, i.e. oversizing is a natural result of "playing for safety."

From the data available to the Institute it would appear that an average tape-frame working a single shift uses ingredients costing £800–£1,000 per year. Obviously, there are variations from these figures depending on the kind of ingredients used (e.g., sago is less costly than a modified starch) and the types of yarns being sized. A figure as low as £600 has been encountered and also one as high as about £1,900. When more than one shift is worked these costs are much greater. It is reasonable to believe that in most mills at least one-fifth of the present cost of size would be saved by the introduction of automatic sizing. Translated into cash, this means £120 per year at one end of the range, to something of the order of £500–£1,000 per year at the other end. The conclusion is drawn that it is possible in some instances for the cost of the "Shirley" box to be returned in this way alone in 2 years. In a fair proportion of mills the time taken would be of the order of 5–7 years (the "Shirley" box is manufactured under exclusive licence by Joseph Hibbert and Co. Ltd., Darwen).

Use of Slurries

The introduction of the "Shirley" automatic size box has made it possible to use slurries, and size preparation by this method is greatly simplified. A slurry is a cold suspension of unboiled size (usually starch + an emulsified lubricant + a suspending agent). Sodium alginate has proved a good suspending agent and carob flour has also been used successfully. Alternatively, a small proportion of starch can be gelatinised by boiling, allowed to cool and then mixed with a cold suspension of ungelatinised starch in water. If desired, the lubricant can be boiled with the small quantity of starch. The gelatinised starch acts as the suspending medium. This last technique has been successfully used in mills, as well as the simpler method.

Slurries can be prepared at very high concentrations, e.g., a sago slurry of 2·2 lbs. of oven-dry ingredients per gallon can be used without difficulty. A slurry mixing chamber added to the standard "Shirley" box is an optional extra. In this chamber the slurry (after passing through the metering pump) is mechanically mixed with water entering the box from the level control equipment, before being passed into the cavity compartment where a vigorous boil is maintained.

The use of a slurry size in conjunction with the "Shirley" box offers advantages for all kinds of yarn but has an extra value for the sizing of beam-dyed (i.e., wet) backbeams, inasmuch as it gives accurate control of size percentage in place of almost complete guesswork.

Dry-feed Attachment

This is the attachment to the "Shirley" box which has aroused so much interest recently. The adhesive is merely put into a container and the lubricant into a small tank associated with the box, and from thenceforward everything is completely automatic. The ingredients, it should be pointed out, are not weighed beforehand. All that is required is that the demands of the equipment for size should be met by periodically (say once or twice per day) replenishing the stocks.

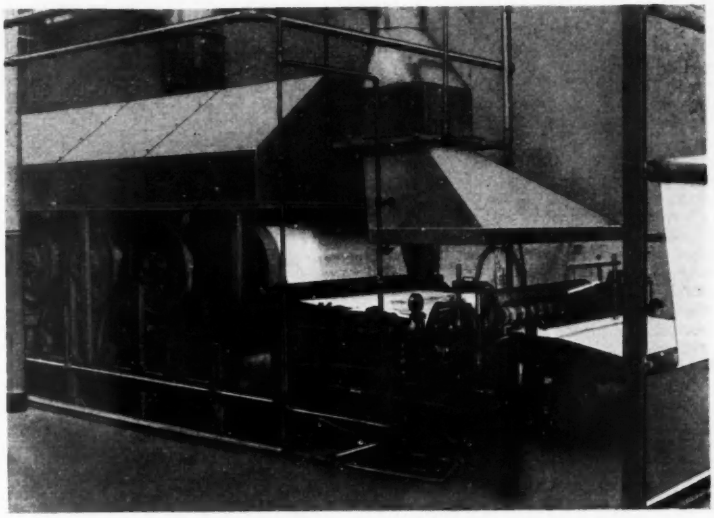


Fig. 3. "Tapers right" side of "Shirley" box and seven drying cylinders. (machine stepped at end of set)

The mechanism works as follows. The usual P.I.V. gears (warp weight; and per cent. size on yarn) operate a special weighing device which weighs out the adhesive in 2-oz. lots at the rate required to give the pre-determined amount of this ingredient on the yarn. The adhesive (usually starch) falls down a chute into a container where it is mixed with water being pumped, again at a controlled rate, from the metering pump. Water periodically operated from the level control device also enters this container and there is a continuous flow of paste consisting of cold water + adhesive into the cavity compartment of the box, where it is vigorously boiled. The P.I.V. gears further operate at a pre-determined rate a special small pump which pumps the lubricant—this is maintained in a molten form in its container—into the pipe supplying steam to the boil pipe in the cavity compartment. The steam atomises the lubricant before it passes into the size.

In conclusion, the dry-feed attachment has been successfully used to size a number of warps to controlled percentages of size on yarn, and though still somewhat in the experimental stage, has shown great promise. Extensive industrial trials under mill conditions will be necessary, however, before it reaches the production stage. The equipment eliminates the necessity for size becks and makes the size preparation and control entirely automatic. The normal human errors encountered in the preparation of size mixings are done away with, and this feature may well be considered of importance by many manufacturers. No time at all is lost waiting for mixings to be prepared. Against these advantages must be set the initial cost of the equipment (not accurately known at present) and maintenance costs but it would be surprising indeed if the equipment failed to give a balance on the credit side.

Other Modern Control Devices

Claims are sometimes made for other size boxes, that control can be exercised just as well as with the "Shirley" automatic size box. These claims are unfounded. Some modern size boxes, with or without ancillary machinery, aim at controlling one or more of the following:—

(1) Size concentration, by avoiding the diluting effects of open steam. Here heat-exchangers, steam jackets, etc., may be used at the beck and size box.

(2) Viscosity of the Size. A standard method of cooking may be employed, for example, high pressure cooking, or homogenisation, to give a paste of reasonably stable or consistent viscosity at a given concentration. To achieve the same uniformity of result from time to time with simple becks and open steam coils would probably not be easy, especially with unmodified starches. A viscometer may be used to indicate the viscosity level of the size.

(3) Variation in squeezing roller pressure to compensate for changes in speed of running of the tape-frame. The main benefit, and perhaps the chief use, of a device of this kind is to reduce the pressure during the "crawl" periods to compensate for the reduced weight of paste which would otherwise be taken up.

All these ways of control offer advantages and, apart from the "Shirley" box, are good in themselves. In compensating for speed a lot of empirical data would be needed to adjust the pressure correctly and it is possible that over-compensation could occur. Nevertheless, even if the compensation is used imperfectly, as will probably occur in the majority of instances, it seems highly probable that there will be a net gain in controlling the amount of size added to the yarn. The "Shirley" box does not compensate for the "crawl" periods and to this extent is at a slight disadvantage, but it must be remembered that the *proportion of the length* of a warp which is sized very slowly is normally very small indeed, representing perhaps no more than 1% of the warp length. The "Shirley" box, on the other hand, automatically compensates for normal changes in the average speed of running.

Taken together, the three items above would allow a reasonably uniform percentage of size to be added under any single set of sizing conditions. The actual percentage added, however, would not be indicated at the tape-frame and would have to be determined by analysis or some other means. To effect a given change in size percentage, experimentation yielding empirical data would be necessary. Further experimentation would also be necessary to allow for changes in conditions such as the nature of the yarn (e.g. cotton, as against spun viscose), weight of warp sheet affecting running speed, etc., which affected the pick-up of paste by the yarn. All in all, the equipment would add only a number of refinements to the crude control exercised at present by the methods commonly used.

Sizing Materials

The last few years have seen the advent of a number of new sizing materials, the introduction of new fibres and yarns, together with higher demands for ease of removal of the size in finishing, having been chiefly responsible. At Shirley Institute, we are sometimes asked whether any better sizing adhesive than starch is available today for sizing normal cotton or spun viscose yarns. The questioner usually has in mind synthetic sizes or "resins" as he refers to them. If the question is answered on broad lines, our remark is that there is practically no experimental evidence at our disposal which indicates that unmodified starch when added to the best percentage does not give at least as good weaving as the best possible weaving with any other kind of adhesive. This statement must be qualified by saying that *every* alternative to unmodified starch, used on its own or as an admixture with starch, has not been extensively investigated. Nevertheless, some of them have, and the result has always been the same. Apart from weaving results, there is cost to consider, especially with sago selling at the low price of roughly £40 per ton, or 4½d. per lb.

Even if a synthetic size, for example, gave slightly better weaving, and with a rather smaller amount on the yarn than sago, the cost would probably be very much greater. Sago is normally suggested for use owing to the fact that it is usually of fairly low viscosity, does not readily gel on cooling, and is stable on prolonged boiling. Other unmodified starches do not have all these points of advantage. For instance, maize (corn starch) is stable but gels readily on cooling. Nevertheless, maize, farina, or tapioca can be successfully used in many circumstances. Modified starches have advantages in special circumstances and so has carob flour, this being better known by the trade names, e.g. "Tragon," "Hydragum," under which it is marketed.

Sodium carboxymethyl cellulose (e.g. "Courlose," "Cellofas") is a water-soluble size very readily removed in finishing and on this account very suitable for spun rayon yarns. It is more costly to use than unmodified starch, however, and this factor alone has made it unattractive to many manufacturers. Starch ethers, which also come out readily in finishing, are being used by some manufacturers for spun rayon yarns.

Normal starch sizes have no affinity for spun nylon and spun "Terylene" yarns but it has been found that a mixture of starch and polyvinyl alcohol* will allow good weaving providing the cloth is not a very close or difficult one. In general, for single yarns, the percentage of size added has to be greater than for a similar cloth construction made from cotton. To give a typical example which approaches the limiting conditions, poplin cloths of 40s, 100% spun nylon (1½ ins. staple, 1½ den.) warp and weft, about 120 ends × 66 picks/in. have been successfully woven using sizes consisting of starch (in various forms, starch ethers, unmodified sago, etc.) plus a proportion of polyvinyl alcohol which is somewhere in the range of one-quarter to one-seventh of the weight of starch. A lubricant is added in the usual manner. It is then advisable to add about 20% of size to the yarn with this construction.

Splitting the yarn in the wet state by one or more rods is recommended for spun nylon and spun "Terylene" yarns or yarns containing these fibres, in order to minimise the raising of fibre during splitting in the dry state at the tape-frame headstock.

High-production Tape-frames

The "Shirley" accelerated drying device has been successfully applied to a large number of tape-frames in Lancashire. By its use it is possible to increase the rate of evaporation of water from the yarn by 50%, and in cases where limitations in drying were the main factors in controlling the speed of sizing it has been possible to increase the speed by something like this amount. Manufacturers who wish to modify a tape-frame already in use will find it of advantage to consider applying the device, especially if the 50% increase in speed meets their requirements as regards either production or the maximum speed at which they wish to run the sorts being sized.

When new equipment is being considered, however, the multi-cylinder machine, i.e. one employing a number of small-diameter cylinders, is worthy of attention. Until recently, multi-cylinder machines could not be seriously contemplated for the kind of sizing done in Lancashire owing to the yarn sticking to, and fouling, the first few cylinders it contacted. The introduction of "non-stick" coatings (perhaps the best-known one is "Fluon"—or "Teflon" as it is alternatively called) have now changed the picture by eliminating the sticking and fouling, thus making a multi-cylinder unit for drying a practical proposition, with the following advantages.

(1) Drying by cylinders is economical in the use of steam.

(2) The rate of evaporation per given length of yarn contact with the cylinder gains (as compared with the use of large cylinders) from the fact that there is an incidental ventilating effect on the sheet of yarn as it presents first one side to a cylinder and then the next side to the succeeding cylinder, and so on.

(3) The cylinders can readily be made to use steam up to about 40 lb./sq. in. pressure, compared with the 10 lb. or so maximum on normal large tape-frame cylinders.

(4) A bank of, say, 9–11 cylinders each of 28 ins. dia., will not be very space-consuming and will give an extremely high rate of evaporation of water, leading to very high production rates.

From the information available it would be expected that if, for example, a normal 2-cylinder frame without accelerated drying could size a dense sheet of yarn at a maximum speed of 10 yds./min., then a 9–11 cylinder machine as above would achieve 30 yds./min., i.e. a three-fold increase in the weight of yarn sized in a given running time.

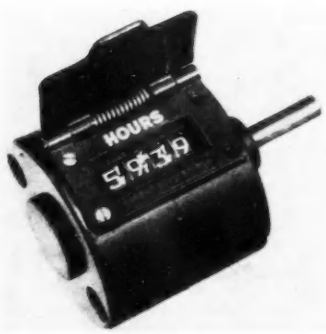
* *Sold under trade names such as "Vinarol DT," "Elvanol 51–05," "Rhodoviol BS125," "Alcotrex 87/L".*

New Service Hours Recorder

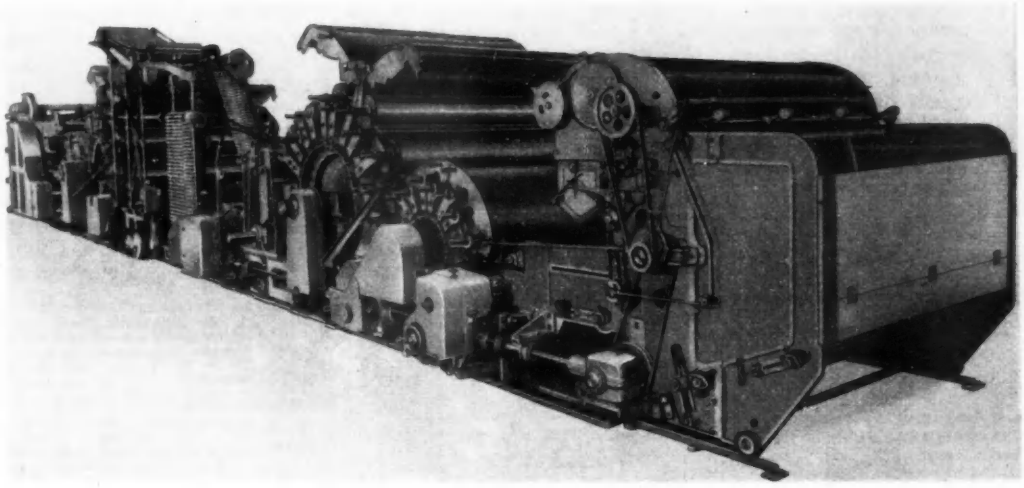
A COMPACT, mechanical service hours recorder has been introduced by English Numbering Machines Ltd., Queensway, Enfield, where the overall length is 1·825 ins., compared with 2¼ ins. for the current E.N.M. unit, which will continue in production. The size permits it to be fitted in many cases where lack of space has prevented or complicated installations in the past.

A protective window cover is a standard feature of the new recorder which has two mounting holes at 1 $\frac{19}{32}$ ins. centres. An optional extra is a driveshaft extension with threaded boss to provide a take-off point for a flexible drive, e.g., installations requiring a tachometer.

Gearing is provided to order, and can be arranged to record one unit for almost any number of revolutions of the driveshaft up to 162,000. Service hours at mean driveshaft speeds up to a maximum of 2,700 r.p.m. can thus be recorded. Before its



introduction, the new recorder was put through stringent running tests, at speeds up to 5,000 r.p.m., under all the different climatic conditions in which it is likely to be used.



A fully automatic two part card set

Platt/Josephy Continental Card Sets*

Designed to handle woollens, wastes and synthetics, these cards are available in widths of 60, 66, $70\frac{7}{8}$ *and* $78\frac{3}{4}$ *ins.*

THE Platt/Josephy continental type carding sets are now being manufactured in the works of Platt Brothers and Co. Ltd., Oldham. These sets are improved versions of the Josephy machines, embodying the latest advances in machine design and technological practice, and operate at high productions with the maximum efficiency. Various standard combinations are available to handle satisfactorily all woollen blends, waste blends, synthetic staple fibres and mixtures of synthetics and wool, cotton waste, asbestos, reclaimed wool, etc.

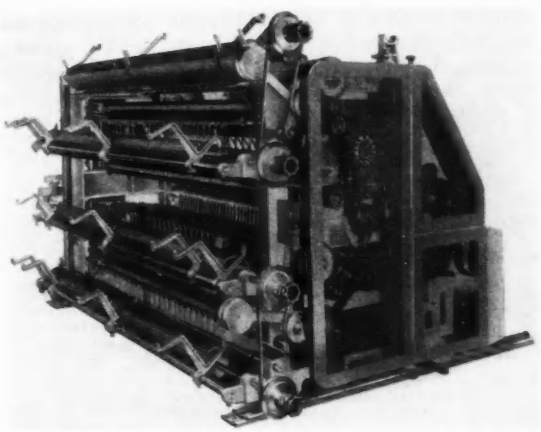
The cards are made in widths of 1,525 mm. (60 in.), 1,675 mm. (66 in.), 1,800 mm. ($70\frac{7}{8}$ in.) and 2,000 mm. ($78\frac{3}{4}$ in.). Bare cylinder diameters are either 1,400 mm. (55 in.) or 1,270 mm. (50 in.), and doffer diameters 1,270 mm. (50 in.) or 1,050 mm. ($41\frac{3}{8}$ in.). Depending on the material being processed and the working power required, four, five or six pairs of workers and strippers are arranged over each cylinder. Breasts are applied where necessary, these being 680 mm. ($26\frac{3}{4}$ in.) or 390 mm. ($15\frac{3}{8}$ in.) dia., the larger size having three or four pairs of workers and the smaller two pairs. The breasts can be covered with saw-toothed wire or flexible card clothing.

A burr crusher can be incorporated after the scribbler or intermediate card. Any type of intermediate feed—parallel or diagonal broad band feed, Scotch feed with centre draw, lap feed, etc.—may be applied between the various cards in the set.

With all sets, the hopper feeder, breast parts, intermediate feeds and tape condenser are mounted on slips and provided with suitable means for racking-out.

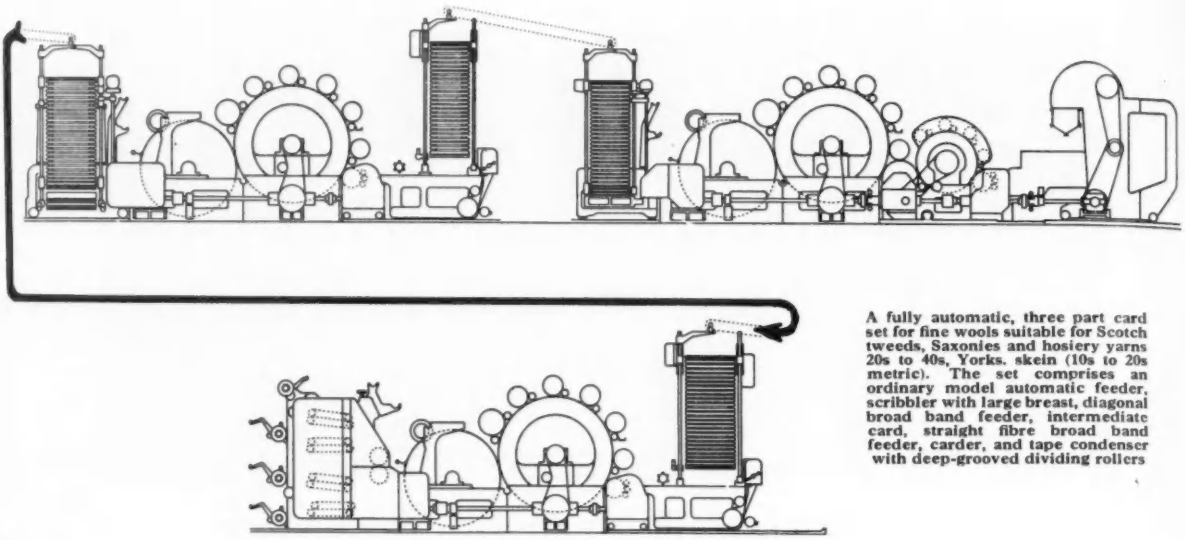
Automatic Hopper Feeder

Two models of the Platt/Josephy hopper feeder are available. The



The Platt Josephy tape condenser

* *Platt's Bulletin, Vol.* 9, *No.* 4.



A fully automatic, three part card set for fine wools suitable for Scotch tweeds, Saxonies and hosiery yarns 20s to 40s, Yorks. skein (10s to 20s metric). The set comprises an ordinary model automatic feeder, scribbler with large breast, diagonal broad band feeder, intermediate card, straight fibre broad band feeder, carder, and tape condenser with deep-grooved dividing rollers

ordinary feeder is suitable for the finer counts, while the large capacity hopper is more advantageous for the carpet and other coarse trades. Any one of four different stripping devices can be fitted as desired. The four types are a standard oscillating toothed comb, a spiked lattice, a revolving brush, or an eccentric comb.

This hopper feeder includes a mechanical control system which, in conjunction with a receding comb, provides accurate weighings. The arrangement is based on a gradual reduction of the distance between the comb and the spiked lifting lattice during the weighing period, so that the smallest amount of material is being fed into the scale pan as the latter approaches its full weigh. The movement of the scale pan beam operates a clutch which immediately stops the spiked lifting lattice and the stripping arrangement.

The scale pan doors are automatically locked in the closed position while material is being fed into the pan and only unlock as the latter starts to descend. The drive to the hopper feeder is by side shaft from the cylinder of the subsequent card. Any of the Platt type automatic hopper feeders can be applied to a Platt/Josephy card set and equipped with a mechanical or electrical weigh mechanism, extended box or telescopic hopper. The new Platt trickle feed automatic feeder also is applicable to a Platt/Josephy card. (Full details of this trickle feed will be given in a later issue of the *Bulletin*.)

Tape Condenser

Platt/Josephy tape condensers with four heights of single rubbers can be supplied equipped with deep- or shallow-grooved rollers and condenser drums arranged for flanged or flangeless bobbins, either full or half length. Leather or synthetic tapes and rubbers are available.

The condenser is driven by gearing from the doffer gearbox and a change place enables the rubbing leather speed to be altered in relation to the doffer speed. A variable V-belt drive allows the eccentric shaft speed to be adjusted to any figure within the range 200 to 500 r.p.m. In addition, there is an individual variable speed drive to each line of surface drums to enable the correct winding tension to be obtained on every drum.

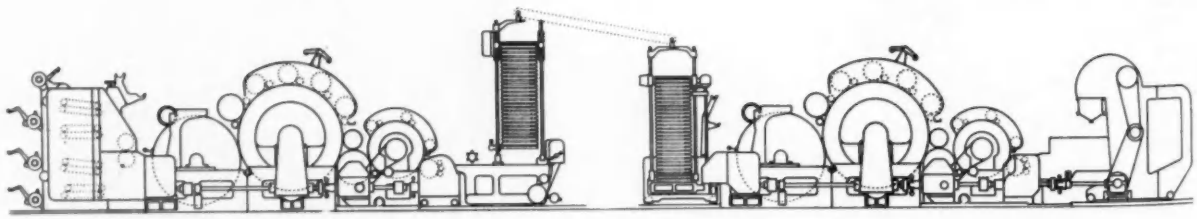
Freedom from vibration and accessibility are two features of this condenser which is mounted on rails and can be racked-out easily. If desired, a pneumatic waste thread remover may be applied.

Platt type condensers with four or six heights of single rubbers or four heights of tandem rubbers can be fitted to the Platt/Josephy card. Where large package spinning is employed, the Platt four height tape condenser with traversing creel and internal drive to surface drums is particularly recommended.

Cards

The main advantages of the Platt/Josephy card are concerned primarily with the transmission of power to the various elements of the machine. Flat belts have been eliminated and replaced by a patented side shaft drive and gearboxes. This reduces the space requirements, eases maintenance operations, provides increased accessibility to the machine and results in a much more positive drive, since it obviates any possibility of slippage through incorrectly tensioned belts.

A 8 h.p. slip ring motor usually



A fully automatic, two part card set for 7s to 20s Yorks. skein (3|s to 10s metric) for carpet, blanket and similar yarns. Incorporated in the set are a large capacity automatic feeder, scribbler with large breast, straight fibre broad band feeder, carder with large breast, and a tape condenser with traversing creel

provides the main drive to the card and in the case of an automatic set the motors of each card are synchronised. This method of driving allows an almost stepless regulation of speed, while the machines are running, over a range of about 30% (e.g. cylinder speeds from 100 to 130 r.p.m.). The motors are mounted either on the floor or, if the conditions on site are suitable, below the floor, the latter method saving floor space.

One of the most important points is the side shaft and gearbox drive to the various components of the card. The case-hardened, alloy steel wheels in the gearboxes run in oil baths and are mounted on oversize shafts carried in ball bearings. Sealing rings prevent the ingress of dust and dirt and ensure that there will be no oil leakage from the totally enclosed gearboxes. An adjustable disc clutch in each drive provides protection against overload, while a special adjustable ratchet clutch gives audible warning in case of any interruption to the normal rotation of the feed rollers.

Each separate part of the card is provided with a special coupling so that the hopper feeder, breast part, etc. may be racked away without dismantling the clutch. The stripper drive is located on the same side as the chain drive to the workers, thus leaving the opposite side of the card completely clear. All roller shafts, therefore, can be made shorter and a special tool is supplied for lifting out the workers, strippers and fancies.

Each roller throughout the card is flanged at the ends, thus allowing the entire width of the roller to be used for card clothing. Consequently, the roller width is equal to the working width. This arrangement prevents an accumulation of fly inside the covers of enclosed cards. The cylinder bends are fitted with side linings, while covers can be supplied if desired.

The doffer wheel is now recessed into the end of the doffer and is driven by the doffer gearbox which controls the delivery speed of the web. Any change made in the doffer speed is automatically imparted to the subsequent unit, e.g. an intermediate feed or tape condenser. When required, however, the speed of these units can be altered without affecting the doffer speed.

Due to the substitution of enclosed gearboxes for flat belts, fettling and servicing of the card become simpler operations, the number of adjusting points is reduced, and what few gear changes there are can be performed quickly without the use of a spanner.

The drive from the cylinder to the side shaft is by V-belts. If desired, a variable V-belt drive can be applied. The latter enables speed changes of the various components to be made quickly and easily without any alteration to the cylinder speed. Other variable V-belt drives also are incorporated in the set to control:—

(1) The fancy rollers, giving an adjustment of surface speed varying from 10% to 40% over that of the cylinder.

(2) The condenser rubbing motion, providing a speed range of 200 to 500 r.p.m.

(3) Each condenser drum independently.

(4) The laying width for automatic intermediate feeds.

All these adjustments can be made while the machine or card set is in operation.

Synthetic Fibre Sewing Threads

IT not infrequently happens that textile materials which from their inherent physical or chemical properties would appear eminently suited to a particular end-use fail when put to the practical test to match up to expectations. An example of this was nylon sewing threads which, because of a tendency to promote puckering at the seams, were not as satisfactory in use as was hoped. Because of this an investigation was begun at Shirley Institute some three years ago into the hot-stretching and setting of thermoplastic yarns (e.g. nylon and "Terylene") which it was hoped would throw light on this problem, and the results were described by Mr. W. Benson (B.C.I.R.A.) in a recent lecture to the Macclesfield, Leek and District Section of the Textile Institute.

To consider what happened to a thread during sewing it was necessary to consider the effect of loads other than just the breaking load and extension at break, Mr. Benson explained. Typical load-extension (stress-strain) curves for materials commonly used as sewing threads indicated that the initial modulus for nylon (as derived from the slope of the curve) was below that of the others, suggesting that if hot-stretching increased the modulus it would improve the yarn as a sewing thread.

Hot-stretching of the yarns was performed on a machine specially built for the purpose, features of which were adequate grip, heating and cooling of the yarn whilst stretched, constant ingoing tension of yarn, good temperature control and more than one passage of the yarn. Because of relaxation at room temperature the stretch obtained was somewhat less than the applied stretch. At 235°C., 100 ft./min., 3 passages, continuous filament nylon retained about 70% and continuous filament "Terylene" about 80% of the applied stretch. Generally spun yarns retained more of the applied stretch.

Measurements made on the yarns included strength and tenacity, loop strength, residual shrinkage and (on "Terylene") time required to reach the temperature of the hot-plate. For nylon (3/60 den.) the values of the breaking load (in grammes) and tenacity (g/d) for the unstretched yarn and an applied stretch of 0% and 20% were 960, 1,027 and 1,026 respectively and 5·00, 5·31 and 6·04 respectively. Corresponding values for "Terylene" (2/75d) were 690, 755, and 840 and 4·54, 4·94 and 6·49 respectively.

For continuous filament nylon (3/60d) the loop strength ratio, which is defined as the ratio of the strength of a pair of interlooped yarns, breaking at the loop, to twice the singles strength of the yarn, fell to two-thirds of the original value for an applied stretch of 28%. Under the same conditions the fall for continuous filament "Terylene" (3/45d) was 45%, for spun nylon (2/70s) 10% and for spun "Terylene" (2/30s) 7%. For the same applied stretch, namely 28%, the shrinkage in boiling water (an important factor where a material may have to be boiled) fell from 9·6 to 5·3 for continuous filament nylon (3/60d) and from 7·1 to 3·9 for continuous filament "Terylene" (3/45d). It was further found that for yarns heated under tension complete setting (and therefore zero shrinkage) was not possible. About 3 secs. on the hot-plate was sufficient to give a reasonable stability to boiling water. Moreover, a 250d "Terylene" yarn required 5 secs. and a 1,000d yarn 8 secs. to reach the temperature of the hot-plate.

During discussion following the lecture, the speaker stated there was not yet sufficient evidence to say definitely whether a hot-stretched thread did, or did not, make a better sewing thread, but he believed some useful practical suggestion would emerge from the experiments described.

Change of Address

The head office of British Titan Products Co. Ltd. has now been transferred from York to 10 Stratton Street, London, W.1.

Weaving and Cutting Face Cloths from Terry Fabrics

If the terry fabric has to be over-edged on all four sides, all washing, bleaching, dyeing and drying should be completed before separation takes place. The cost of over-edging is the same regardless of where the separation takes place

By T. HARGREAVES

TERRY fabrics for home use can be divided into four classes:

(1) The normal sized bath towel about 20 to 24 ins. wide and from 36 to 48 ins. long with hemmed ends.

(2) The guest towel size about 16 ins. wide and 28 ins. long, with hemmed ends.

(3) The finger tip size about 11 to 12 ins. wide and 18 to 20 ins. long with a fringed end about $\frac{3}{4}$ to 1 in. long at each end.

(4) The face cloth size about 11 to 12 ins. wide by 11 to 12 ins. long and which is finished by over-edging all the four sides by an overlocking stitch; usually done by a special type of three needle sewing machine.

All these four types are often woven two or three in a width, side by side, in the reedspace of the loom. All classes of homes and very many commercial and industrial concerns use an enormous range of terry fabrics which, in general, are subjected to rough usage and very frequent laundering. In consequence of this, considerable importance attaches to the selvedges which must be firm and strong enough to withstand the severe strains imposed during use, in washing and drying, etc. Either the selvedge must be self woven, or if more than one in a width, then it is imperative that the cut inner selvedge must either be hemmed or securely bound to prevent unravelling of the ends involved in the selvedge. Sometimes the loose cut inner selvedge is overedged by the three needle sewing machine.

Use of doups or leno weave for the inner selvedge is not satisfactory for terry fabrics which are expected to get rough usage and frequent laundering; such a selvedge can only have a very short life. The customary method of weaving the inner selvedges is to use about 24 to 36 ground warp ends drawn one per heald eye and entered two ends per dent. Three dents are then left empty to form a cutting line. Twenty-four to 36 ground warp ends are then entered one per eye, two per dent in the reed for the next inner selvedge. Twenty-four ends are sufficient for this type of inner selvedge if finished by over-edging, but if a hemmed finish is required, then it must be woven wide enough to allow for hemming and this usually needs 36 ends in 18 dents, or about $\frac{5}{8}$ to $\frac{3}{4}$ in. wide.

Factors Affecting Separation

The system of bleaching or dyeing operated by the manufacturer decides in many instances where, when, and how those two or three widths of woven terry fabric shall be separated. If the yarns from which the fabric is woven were pre-bleached, or dyed, and the fabric sold in the loom state, then the two or three widths in the woven width of cloth could be separated at the loom during weaving.

If the cloth is to be bleached or dyed in rope form or open width, then it is better not to separate the cloths. To do so means multiplying two or three times the length to be handled by the bleacher and dyer, and drying machine. In such a case, separation should take place after washing, bleaching or dyeing. If the terry fabric is to be over-edged on all four sides, as is the case with face cloths, then all washing, bleaching, dyeing and drying must be completed before separation takes place.

Finger tip towels can be separated at the loom during weaving without cost or trouble. The cut inner selvedges are over-edged or hemmed in 120 yds. lengths, assisted by employing a driven roller at the back of the sewing machine to carry the sewn material away from the sewing head.

Bleaching and dyeing departments are not very keen on this method because of the extra long lengths of very narrow cloth involved added to which, of course is the increased cost. They prefer to bleach or dye the multiple cloths in the original woven full width. This, however, does not suit the cloth receiving and making-up sections. They are now given the task of first separating the double or treble widths of fabric in the full woven width and then cutting each cloth one by one from these long and narrow lengths. Splitting the cloth into two or three widths at the loom costs nothing, but dividing them after bleaching, dyeing and drying becomes a complicated operation which can be rather expensive.

If weaving two 22 or 24 ins. towels side by side, separation of the two cloths is best achieved at the loom without cost, and hemmed or over-edged in the full roll length. The dyer will be quite agreeable as the 22 or 24 ins. width of each towel is very convenient to handle and the cloth room like it because they do not have to be responsible for any flaws caused by uneven or ragged cutting. When cut during weaving, at the loom, the inner selvedges are regular and hardly ever get out of line.

There are several methods of separating the two or three cloths in the woven cloth roll. One simple way does not require any machine, a table 4 ft. long will do admirably. A rotary cutting blade—a motor driven apparatus—usually used to cut individual towels from the cloth roll is clamped

to the edge of the table on the side where the operator stands. The 120 yds. of cloth to be cut is then positioned at the opposite end of the table and left in the truck on which it was brought. The starting end of this cloth is now brought over the surface of the table. The operator pulls it towards her by placing the palms of her hands on the cloth and drawing it along. The cloth is guided so that the cutting line is operated upon by the rotating cutting blade. This action makes a neat separation of two cloths, one from the other. Only one cut can be done at a time. If there are three cloths in the width, then a second operation is needed to separate all three cloths. As the cloth is cut and drawn forward, it falls in folds on another low built cloth truck positioned partly under the table.

A woman usually takes about 5 mins. per 120 yds. long cut, including bringing—starting—cutting and removal, ready for the next cut. Say 20 to 25 yds. net cut length per minute. Some manufacturers have gone to considerable effort to try and perform this splitting operation by machinery instead of by hand. Every machine so far evolved for this work has usually been made locally according to the ideas formulated by the engineering staff of each concern. There does not appear to be any machine that can be purchased to do this job. The difficulties involved in such a machine are:

(1) **To guide the cloth in a true line as it travels swiftly through the cutting knives.**
(2) **To remove the two or three separated cloths evenly and rapidly away from the cutting knives.**
(3) **Keeping the cloth horizontally straight when starting up a new length.**
(4) **At the time of cutting, and after cutting, to draw the cloth along at an even tension across the width of the cloth.**

To guide the cloth in a true line to the cutting knives requires the aid of two sets of air operated cloth guides, plus several tension bars. Air operated cloth guides need a long length of cloth from the last carrying bar, or roller, in order to give them an opportunity to function correctly. The second set of air operated cloth guides is a necessity to correct any discrepancy of the first set. It is extremely difficult to maintain the cutting line between the two cloths in perfect line with the cutting blades, and doubly difficult if trying to make two cuts to separate three cloths at one time. Should the cloth be incorrectly guided

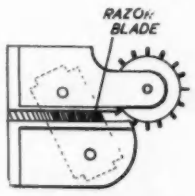


Fig. 1. Small metal instrument designed to hold razor blade for separating terry cloths during weaving

to the cutting knives it might be cut in the wrong place and damaged. To offset this risk of damaged cloth, the weaver is directed to weave the inner selvedges wider, using about 12 extra ground warp ends for each selvedge on each side of the three empty dents which form the cutting line but this, of course, is an added cost.

Production

A machine such as the one described has a maximum speed of about 75 yds./min. which is considerably faster than the 20 to 25 yds./min. net speed by the table method. Incidentally, the 75 yds./min. is running speed not production speed. The usual cloth length of 120 yds. will need less than 2 mins. running time. Then it will be necessary to stop and sew the beginning end of the next roll of cloth to the tail end of the roll of cloth just cut. It will also be necessary to sew those ends together in the most perfect horizontal line that is possible, to preserve equal cloth tension.

This starting place must be slowly run to guide its cutting lines to the cutting knives or damaged cloth will occur. It is safe to assume that this lost starting up time will take up about twice the actual running time, and so production speed will be about 25 yds./min. which is very close to the table method. This could be speeded up a little by having a second operator sew the cloth ends together but, again it is added cost and in the end it is cost alone which ultimately determines which is the better method—machine or table.

A machine for this purpose needs a floor space of over 7 yds. in length, plus extra room for sewing the cloth at one end, against an overall length of 2 yds. by the table method. A 1 h.p. motor is required for the drive which consists of rollers and these must have a special covering to avoid dragging the terry loops out of the cloth. The cutting knives used in the machine are the same type as used for the table method. The machine must be fitted with lateral slots to hold them and allow for adjustments.

Cutting at Loom

Splitting the cloths at the loom during weaving is a very simple operation. Several types of cutter are available, such as that shown in Fig. 1 but an ordinary safety razor blade held between two pieces of wood will also do the cutting, pick by pick, as the woven cloth passes forward towards the breast beam.

This two-piece wooden safety razor blade holder has a slot cut in each piece at the side. This slot is made to ride on the cloth as it is being woven. A few inches of the weft in the woven cloth is cut from a point near to the loom breast beam in the direction of the cutting line. This allows the razor blade holder to be inserted, and which being now supported by the cloth, is carried forward until it meets the breast beam. The cloth, however, keeps moving forward through the action of the turning cloth roller. This presses each pick in turn against the cutting edge of the razor blade, which cuts them one by one, thus splitting the cloths.

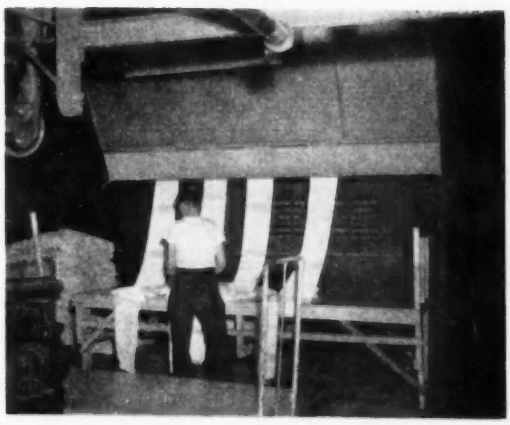


Fig. 2. Towels woven 3 and 4 in a width and cut lengthwise on the loom, then over-edged along the cut selvedges and bleached, are being delivered fully dried from a loop drier

Knitting Stockings from "Agilon"* Yarn

Detailed stocking construction particulars are available from B.N.S. for firms wishing to have full information on how to obtain the best results

"AGILON" yarn is a continuous filament nylon yarn possessing latent properties of stretch which develop when yarn or fabric is subjected to wet finishing treatments. Stockings made from "Agilon" yarns have a two-way stretch or extensibility, rendering them shape-fitting and comfortable in wear. Stockings made from "Agilon" yarn require a slightly different knitting technique from that employed with conventional types of nylon yarn. It is important, therefore, that there should be a close liaison between the knitter and finisher if the fullest advantages are to be obtained from the use of "Agilon" yarn. To obtain the best results it is recommended that "Agilon" yarns, in appropriate deniers, should be used throughout the entire construction of the stocking.

Yarn Supply

"Agilon" yarn is produced in 15/1, 20/7, 30/10, 45/15 and 60/20 denier; all of which are suitable for the manufacture of stockings. For multifilament yarns the normal cone has been found to be quite satisfactory, and can be used without the aid of any anti-snarl device.

Since the yarn is already oiled, it can be knitted without the aid of oil or emulsion trough. Monofilament yarns are more subject to snarling than multifilament yarns, and it has been found that the parallel sided package, used in conjunction with the disc tension device, gives the most satisfactory results. These discs should be 3¾ to 4¼ ins. dia. (top disc) and having a flat edge not less than ⅛ in. thick, over which the yarn runs.

Knitting

As is the normal practice when making any major yarn change, it is advisable to ensure that there is no roughness or signs of wear on all yarn contact surfaces.

Full Fashioned stockings.—The threading up is the same as for normal dry knit yarns using minimum tension consistent with good yarn control. When using tension discs for monofilament yarns it is important to appreciate that they apply a varying amount of tension depending on the size of the package. With the size of the tension disc fixed, and the size of the package variable as knitting proceeds, the only adjustment possible is in the height of the first guide above the tension disc.

Initially this guide should be set at a height consistent with complete control of the yarn. As the package decreases in size, more tension will be applied to the yarn, due to the increasing angle made with the disc, and in some cases it may be found advantageous to raise the guide, by approximately 1 in.

Construction.—The aim of all manufacturers of these hose should be to control the size of the knitted loop to give a stocking with the correct degree of stretch after development, and to obtain the optimum fabric appearance. The following suggestions may prove helpful when using multifilament yarns in order to obtain full elasticity in the finished stocking:

(1) The fabric is made with 10% fewer courses per inch than when knitting the conventional nylon hose. The number of links in the chain is reduced by 5% in all parts of the hose.
(2) The knitted hose as it leaves the machine is approximately 1½—2½ ins. longer than the conventional hose would be.
(3) When using monofilament yarns the adjustment required to be made to the number of courses and knitting quality is very small.

The importance of the stitch size will be appreciated when it is realised that the degree of bulking can be controlled by the size of the loop. This loop size should be the minimum complementary to the fullest bulking possible, bearing in mind that too open a fabric will lead to greater handling difficulties. The gauge of the machine has a direct bearing on this relationship and the following gauges of machine are recommended, to be used in conjunction with the deniers noted. Gauges below the limits noted, will not produce satisfactory stockings from "Agilon" yarn.

	51 G.—60 G.	45 G.—51 G.
Welt ..	30 or 45 den.	45 or 60 den.
Panel ..	15 or 20 den.	30 or 45 den.
Splicing ..	20 or 30 den.	30 or 45 den.

Three sizes of hose are recommended:—

Small: with grey foot size of 9 ins.
Medium: „ „ „ „ „ 10 „
Large: „ „ „ „ „ 11 „

This range will cover the normal hose size range, and the leg length should be increased correspondingly 1½—2½ ins.

Circular Knit Hose

The string-up of the yarn should be as simple as possible, using minimum tension consistent with good yarn control. For multifilament yarns on cone, no anti-snarl device is necessary, but for monofilament yarns a single disc tension is recommended.

Construction.—The following suggestions are made for multifilament yarns, in order to obtain the full elastic qualities of the final product:

(1) The number of links in the chain is reduced by 5% in all parts of the hose.
(2) The resultant hose should be measured in the conventional way and the quality adjusted until the foot size is 1 in. larger and the length of the leg 1½—2½ ins. longer than the conventional hose.
(3) When using monofilament yarns the adjustment required to be made to the number of courses and knitting quality is very small.

Because the changes in machine quality affect the appearance of the fabric, the ankle stiffening should be reduced to a minimum. To measure the hose made from "Agilon" on the conventional board, a careful system of quality control should be instituted. The following sizes of hose are recommended:—

Small : with a grey foot length of 9 ins.
Medium: „ „ „ „ „ „ 10 ins.
Large: „ „ „ „ „ „ 11 ins.

The leg length will be correspondingly increased from 1½—2½ ins. above the normal. The gauge of the machine has a direct bearing on the relationship between loop size and maximum bulking possible, and the following gauges of machine are recommended to be used in conjunction with the deniers noted. The use of gauges below these limits will not result in the production of satisfactory stockings from "Agilon" yarns.

	370N × 3½ or 400N × 3¾	340N × 3½
Welt ..	30 or 45 den.	45 or 60 den.
Panel ..	15, 20 or 30 den.	30 or 45 den.
Heel and toe ..	30 or 45 den.	45 or 60 den.
Splicing ..	20 or 30 den.	30 den.

Finishing the Hose—Seaming—Full Fashioned

The hose are seamed immediately on leaving the knitting machine without being preset. Seaming is carried out as for conventional hose, using normal seaming yarns, but the foot should be stretched slightly during seaming to give the full elasticity of the seam in the final product. It is recommended that if the full advantages of "Agilon" yarn are to be obtained this type of yarn should be used throughout the entire construction of the stocking, and not with parts of the stocking made from conventional yarn and parts from "Agilon."

After dyeing and finishing, the hose should measure 20—25 ins. on the counter according to the length required to produce the best counter appeal with an unpuckered seam. Detailed stocking construction particulars are available for firms wishing to have information on how to obtain the best results with "Agilon" yarn. This information can be obtained on application to B.N.S.

* *"Agilon" is the trade name for elasticised thermoplastic yarn produced according to a process developed by British Nylon Spinners Ltd., and is a registered trade mark.*

Finishing Nylon Tricot Fabric*

Fabrics for pleating should be either scoured and dyed at temperatures not greater than 158—167° F., rinsed and stenter dried, or even given a mild pre-setting treatment at about 302° F. which will minimise creasing during subsequent scouring and dyeing

THE normal procedure for finishing tricot fabrics comprises four stages—preparation, drying and setting, bleaching and dyeing, and final drying. This sequence needs modification to meet specific requirements, such as preparation of fabrics for permanent pleating, finishing of fluted type fabrics and other speciality constructions. In addition, fabrics may be set in the loomstate or, alternatively, post-set as a final operation provided that certain requirements are fulfilled.

Preparation

Tricot fabrics are scoured in rope form on winch machines, or in open-construction bags of a suitable size—e.g. one 60 yd. piece to a bag—in paddle machines. For processing on winch machines, it is necessary to convert the fabric to tubular form. The pieces are stitched lengthwise into tubular form on a machine using, for example, a chain stitch of approximately five stitches to the inch for 30 den. locknit fabric. For convenience and level sewing, the edges of the fabric may be marked at regular intervals with a fugitive tint—it is preferable for this to be done on the knitting machine. It is not usually necessary to tube the fabrics for scouring in bags.

Diluted alkaline soap solution—e.g. 0·2% solution of soap containing 0·1% soda ash—or solutions of proprietary synthetic detergents are satisfactory scouring agents. It is inadvisable to exceed 113°F. (45°C.) at this stage and a 30 min. scour should be adequate: stained fabric, however, will require more concentrated detergent solutions and longer processing times, and may require hand treatment. After scouring, rinse the fabric in warm and cold water.

Fabric from the winch machine and bags from the paddle machine are loaded into a hydroextractor, and hydroextracted. To avoid creasing or distorting the fabric, this process should be as gentle as possible, compatible with adequate removal of water. In order to develop full fabric character by complete relaxation of tensions and elimination of stitch distortion, the fabric may be wet out and allowed to contract before scouring. During this operation, the fabric, under minimum tension and as free from creases as possible, is supported on a conveyor web and sprayed with water or weak detergent solution at about 185°F. (85°C.), it is then sprayed with cold water.

Drying and Setting

The fabric dries very quickly either in tubular form on a tubular drier or in open width on a stenter; high drying temperatures or long drying times, therefore, are not necessary. The dried fabric is then set. It can be set in tubular form on a combined drying tentering, and setting unit, or in open width by any of the conventional methods, i.e. hot gas stenter, radiant heat stenter or in batch form in a pressure steam autoclave. For economic reasons, it is desirable to combine the drying and setting in a continuous manner. Opened fabric is again converted to a tubular form ready for further processing on winch machines. In order to avoid a permanent centre crease when a hot roll machine is used for setting, two pieces of fabric may be sewn edge to edge to render them tubular. They are then scoured, and dried and set on a combined tubular tentering and drying machine feeding into a hot roll setting machine.

Bleaching and Dyeing

Bleaching and dyeing operations are usually carried out on winch machines. Some fabrics—e.g. mesh constructions—can be dyed in bags in paddle machines. The latest development is the use of high temperature pressurised equipment in which the fabric is scoured, dyed and set in open-width in batch form. It is essential that the fabric can be batched evenly and free from distortion, and that the size of the batch is controlled to ensure that it is uniformly penetrated by the liquor. In general, densely constructed fabrics are unsuitable for dyeing in this way, but by dyeing several small batches of fabric, instead of one relatively large batch, the range of fabric constructions which can be penetrated satisfactorily is extended.

It is recommended that the heat set fabric is scoured at 167°-185°F. (75°-85°C.) for 20-30 min. before dyeing. If the fabric has been slightly yellowed by thermal oxidation during setting, the discolouration can be removed by bleaching with sodium chlorite or with peracetic acid. The fabric is then dyed with disperse dyes at 167°-185°F. (75°-85°C.) for about 45 min. or until on shade. It is usual to include a dispersing agent in the dyebath and to commence dyeing at 120°F. (50°C.). The dyed fabric is rinsed and hydroextracted prior to drying.

The fabric is dried on a tubular drier and rolled on cardboard tubes, or opened out and stenter dried and batched. To facilitate layering for cutting, it is usual to apply resin strip (continuous or discontinuous) to the edges of the fabric by means of a doctor roller rotating in a trough containing an aqueous resin dispersion—e.g. polyvinyl acetate—prior to the fabric entering the drying zone. When the fabric emerges from the drying zone, the edges are removed by electrically heated wires, or rotating circular knives, leaving about ¼ in. of resin strip on each edge of the fabric.

Presetting

If the fabric is clean and not tinted, it can be set in the loomstate, because the normal yarn finishes are readily removed by scouring after the setting operation. This method can be used for stable constructions, e.g. sharkskins, which, if not set in the griege will develop cracks during low temperature scouring in rope form. If suitable equipment is available, it is preferable, however, to scour such fabrics in open width before setting, thereby ensuring a clean fabric and a good finished white.

Loomstate setting of extensible knitted fabrics results in a thin and papery handle when compared with that of similar fabric set and finished after relaxation during scouring. On the other hand, some shrinkage can be allowed during heat setting to counteract this factor, and much depends on customer's requirements. The use of presetting as a means of obtaining excessive fabric yields results in poor quality fabrics.

Post-setting

This method lends itself more to the processing of woven fabrics which can be handled in open width on dye jiggers during scouring and dyeing. If applied to warp knitted fabrics which are processed in rope form, it is recommended that scouring and dyeing temperatures do not exceed 158°-167°F. (70°-75°C.). Disperse dyes should be carefully selected for application at this temperature as well as for fastness to the postsetting treatment. It is our experience that these dyes are less affected by radiant heat setting than by hot air or pressure steam. Discolouration of the nylon fabric must be avoided during post-setting since this will affect the shade.

Fabrics for Pleating

These fabrics should not be fully set. They should be either scoured and dyed at temperatures not greater than 158°-167°F. (70°-75°C.), rinsed and stenter dried, or given a mild pre-setting treatment at about 302°F. (150°C.) which will minimise creasing during subsequent scouring and dyeing. The drying temperature need not exceed 110°C. and at this stage it is advisable to apply a resin edge strip to assist subsequent handling of the material. If the fabrics are fully set by the finisher, they cannot be satisfactorily pleated either by the hot roll method or in the steam autoclave.

(*continued on page* 86)

* *Reproduced from their "Technical Service Bulletin," by courtesy of British Nylon Spinners Ltd.*

Features and Adaptability of the Woollen Ringframe

In order to secure the best results the frame must be "custom built," i.e., spindle length and pitch, diameter of ring and bobbin, size of rollers, etc., must be designed to suit the type of blend and range of counts expected to be spun

By J. A. B. MITCHELL*

ANOTHER striking advantage of the continuous spinning frame is the considerably less area of floor required for ring spindles compared with an equal number of mule spindles. This is not surprising, of course, when one considers the unusually large amount of space needed for the mule with its long carriage traversing over a distance of 6 or 7 ft. during spinning and winding. Some manufacturers have rated this saving of space even more highly than the benefits attendant on a gain in production. Regardless of which is the more important no doubt exists that together these two give the ringframe a tremendous advantage over the mule. Fig. 72 shows a drawing to scale of a rectangular area required for working a pair of mules of 840 spindles, 2¼ ins. pitch, with 72 ins. stretch. Into this space, without undue crowding, can be placed 6 frames with 180 spindles of comparable pitch (4½ ins.) to work from the same condenser. This leaves a passage of 3 ft. between the frames and a main alley 6½ ft. wide between the two groups of machines if installed as shown in the plan.

Actually more frame spindles could be accommodated in this area by narrowing the alleyway, yet retaining the passage of 3 ft. between the spindle rails as before. For example, on the basis of a 28 end condenser bobbin instead of 30 it would be possible to install 6 frames each of 196 spindles of similar pitch on this same plan of layout, but the alleyway would only be 2½ ft. Thus 1,176 frame spindles could be accommodated in the area required by 840-mule spindles. Of course each case must be studied on its merits, since the actual number of frame spindles deployable in the space occupied by one or more pairs of mules depends on several factors, but as a general rule new frames installed to replace mules must have the number of spindles which is a multiple of the number of ends on the condenser bobbin in order to work with the existing cards. By way of illustrating an important point, assume that 1,200 frame spindles are being installed to replace old mules. This total could be made up of 6 frames of 200 spindles each, or 8 frames of 150 spindles, but the two assemblies would not require exactly the same space. One might be preferable to the other for reasons of size and shape of the area available. Apart from space two additional factors influence the size of frame:—

(1) The optimum number of frame spindles per operative for the most economical working and efficient minding.

(2) The correlation of the size of the frame with the condensers which supply it.

It is impossible to discuss here the full implications of either of these additional considerations in the choice of unit, but that they are relevant in a modern approach to plant layout and efficient management cannot be disputed. Reference will be made to factor (1) in the next section dealing with the labour force required, but it is sufficient to state here that one minder may find it almost impossible to attend to 200 spindles, but be perfectly capable of minding 150 without being harassed.

* *Scottish Woollen Technical College, Galashiels.*

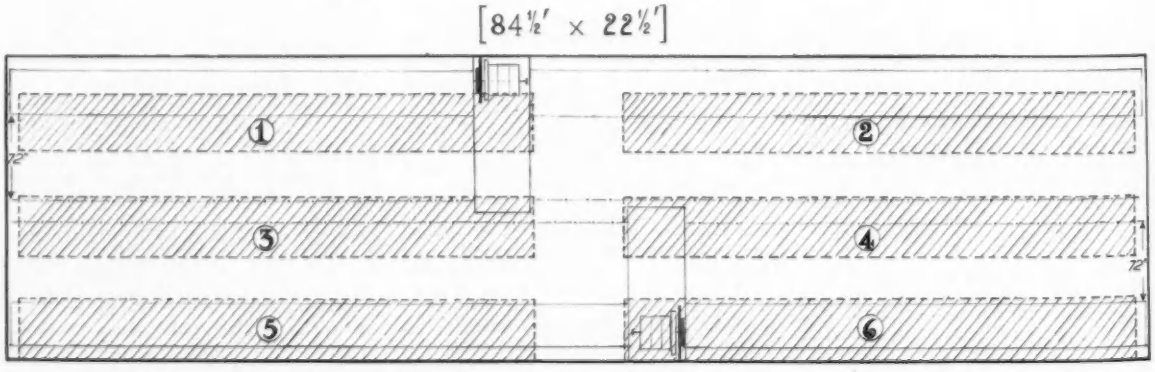


Fig. 72. Area occupied by two mules—840 spindles 2¼ ins. or 6 ringframes—1,080 spindles 4½ ins.

The twofold gain, referred to earlier, may be demonstrated by linking the production ratio of mule and frame with the spindle population of each machine in a given area of the floor. Assuming for this purpose that on the average 1,100 frame spindles can be placed in the working space needed by an 840 spindle pair of mules, then on the basis of an output ratio of $2\frac{1}{2}$ to 1 in favour of the frame it follows that fully three times the weight of yarn can be obtained from the area formerly occupied by a pair of mules by substituting the appropriate number of frame spindles. When the rateable value of this area is added to the other overheads which are chargeable to floor space, then the benefits of installing the continuous machine—reflected in the spinning costs—are worthwhile. The limited demand on floor space becomes a very attractive feature of the ringframe when spinning power has to be increased. It may happen that a frame of 120 to 180 spindles can be fitted into an area too small for even a single mule and so provide an addition to the weekly output equivalent to that of two or three times this number of mule spindles, the installation of which might possibly require an extension to the existing building.

Capital Cost

Though surprising it is nevertheless a fact that the initial cost per spindle of the ringframe has always been much higher than that of the mule, a factor which with others, has hindered the ready acceptance by the woollen industry of the continuous spinning machine. In these days of rising prices it is useless quoting current costs per spindle of frame and mule, but it is relevant to mention that for many years the initial cost of the ringframe, when quoted on a spindle basis, has been consistently about three times the figure asked for the mule, so at present the scales are heavily weighed against the continuous machine.

Little more need be mentioned beyond drawing attention to the fact that this disparity in capital cost, when written against the frame as an annual charge, e.g. interest on capital, depreciation, etc., may tend to offset part of the expected gains in conversion costs per lb. of yarn arising from a twofold or threefold increase in output. Much will depend on the number of spindles allocated to each operative and the rates of payment to minders on mule and frame, but at the same time-rates for piecers of similar age group and comparable skill there appears to be a saving of 28–30% in costs of spinning per lb. of yarn on the frame compared with the same when mulespun. By employing younger minders for the frame at slightly lower rates of pay the reduction in spinning costs would be over 30%. This assessment is based on the same rates for depreciation and interest on capital on a frame whose initial cost per spindle is roughly three times that of the mule. The figures given in Table 9, extracted from Platt's Bulletin,* are reproduced here with the firm's permission. These striking figures suggest that the saving in spinning costs is in the region of 40%.

Labour Required

Closely related to the preceding is the question of the number of spindles per operative in woollen ring spinning. This depends on several factors such as:—

(1) Speed of the frame.
(2) Range of yarn counts processed.
(3) Quality of the material.

In a large ringframe department an additional factor would be the layout of the many machines. Except in the case of narrow gauge "weft frames," i.e. for spinning weft yarn direct on to the shuttle pirn, the standard model is usually restricted to a maximum of 240 spindles for reasons connected with limiting the length of machine. Users may prefer a frame comprising 150 to 200 spindles, while a firm, experimenting with ring spinning for the first time, may install a smaller frame of say, 100 to 120 spindles as a trial. In the latter case there is a danger that the data gained in such a test may convey a wrong impression of output, efficiency, running costs, if based on the performance of a shortened machine where the one minder could actually supervise many more spindles. The number of operatives needed must obviously depend on the number of frames and the plan of layout, but in the better-class trade it is found that one trained operative can attend 150 to 180 spindles when spinning warp yarns in medium and fine counts. The figure for work load when stated as "spindles per operative" is very much below that normally encountered in mule spinning where it is common for two "piecers" to attend to a pair of mules comprising 700 to 840 spindles. When reckoned as "lb. per operative hour" however, the advantage is still with the frame as is shown in Table 9.

Table 9

	Production		Spinning Cost
	Per Spindle Hour	Per Operative Hour	
Mule	**89**	**156**	**273**
Frame	**283**	**278**	**160**
Increase ...	**218%**	**78%**	—
Reduction ...	—	—	**41%**
Direct Comparison			
Mule	**100**	**100**	**100**
Frame	**318**	**178**	**59**

Adaptability

Indifference to and prejudice concerning the machine allied to ignorance of the technique of continuous spinning have all combined to retard development of the ringframe in the woollen industry. It is often condemned without trial and regarded by many spinners as a failure. This is unfair and quite unwarranted in the light of experience today. The continuous spinning frame has made great headway in the carpet industry, so much so that it is reliably reported that 90% of carpet yarns are now frame spun. What is perhaps not so widely known and appreciated is that high-class weaving yarns up to 45 cut or 35 Y.S.W. are being made successfully on the continuous machine. It must be conceded, however, that the mule, with its twist and drag change-places and the many forms of carriage movement derived from the use of scrolls, provides many delicate adjustments for drafting and it is thus more flexible and better equipped for "humouring" poor qualities of material.

Admittedly, fewer change-places are available on the ringframe but if these are used properly then a good spin and a satisfactory yarn can be obtained. On more than one occasion when the frame has been stated to be unsatisfactory, the real reason for the failure has been faulty adjustment of the machine parts. The spinning overlooker must realise that, though simple in comparison with the mule, the machine does not automatically spin every material successfully under the same set-up. He must know when and how to alter false twist so as to control fibre movement in the draft zone, what to do when frequent thread-breaks occur below the front rollers, also how to alter turns/inch and draft. He must appreciate the need for maintaining close setting of tubes to the roller nip and

*Vol. VIII, No. 9.

the importance of having pressure at the maximum on all covered bosses of the front set.

On the ringframe a "piecing" is made outside the draft field thus denying it the levelling and binding influences which are at work in mule spinning as the carriage continues to draw and twist the repaired slubbing; but the piecing fault is not so serious as it might at first appear. One outstanding merit the frame has is the freedom from snarls in the yarn during spinning. The high degree of tension to which the yarn is constantly subjected during twisting and winding prevents snarls forming, so that this source of much trouble in the subsequent use of mule-spun yarn does not arise in the product of the continuous machine.

Today when a large spinning package is favoured by certain sections of the industry the frame has a distinct advantage over the mule. Despite an appreciable rise in the net amount of yarn on the modern mule cop it is still far short of the weight of yarn possible on a frame tube 10 to 11 ins. long, built on a wide ring. On heavy counts (4–12 Y.S.W.) roughly 16 ozs. yarn can be accommodated on the tube of ringframes, such as the M.W.R.2, which are specially designed with spindles of wide pitch and rings up to $5\frac{1}{2}$ ins. dia. for spinning carpet yarns. Not every manufacturer has succumbed to the big cop craze, but there is always the advantage of the little extra weight in securing longer lengths of knotless yarn and in higher spinning efficiency. The ringframe has this great asset without actually resorting to extremes in size of package.

A rather pointed criticism, levelled against the continuous spinning machine in the early days in Lancashire, concerned its inability to spin and wind the thread on the bare spindle and in consequence be at a disadvantage compared with the mule for cotton spinning. Though still valid this complaint is not regarded as serious today. Nevertheless a practical solution to this difficulty would be another step forward in meeting the desire for a larger cop and would be of incalculable value to all textile industries using the ringframe for spinning and twisting. Finally, it must be recognised that in order to secure the best results the frame must be "custom built," i.e. spindle length and pitch, diameter of ring and bobbin, size of rollers, etc., must be designed to suit the type of blend and the range of counts the machine is expected to spin.

The ringframe is fairly adaptable to changes in the blend and in the size of the yarn, but like any other process machine it must be adjusted to meet requirements of the material being spun. In the last resort only a thorough understanding of the technique of drafting with false twist, of the underlying principles of ring and traveller winding, combined with a good knowledge of the various parts of the mechanism can ensure success in ring spinning in the woollen industry. If these articles have been of any assistance in this connection they will have amply fulfilled their purpose.

(*Concluded*)

Nylon Tricot Fabrics

(*continued from page* 83)

Fluted Fabrics

The object in finishing fabrics of this type is to obtain a pronounced and regular flute. It is not possible to stabilise them to the standard of flat fabrics and a compromise between appearance and stability has to be made—it should be appreciated that fabrics of this type are generally used only for trimmings, as on underwear or nightwear.

Several methods of finishing these fabrics have been suggested. They can be processed in tubular form on tubular setting equipment, or passed through a stenter in this form stitched to an end-cloth. Alternatively, they can be stentered flat in open width—without excessive widthway tension—and then tubed and scoured in rope form to develop the flutes. Normal setting temperatures should not be used when processing the fabric flat, since these conditions prevent subsequent development of the flutes during scouring. It is suggested that temperatures of the order of 300°-350°F. (150°-177°C.) should be used, but finishers are advised to carry out trials to determine the most suitable treatment. The higher the temperature employed, the less the degree of flute, but the greater the stability obtained.

Stiffening

Nylon fabrics can be stiffened with synthetic resins of the urea-formaldehyde or melamine-formaldehyde type; shoe fabrics are heavily stiffened with these resins. The use of urea-formaldehyde resins is increasing in popularity and these resins can be combined with thiourea to give a flame-proof finish. The method of applying the aqueous resin dispersion depends upon the construction of the fabric. If the fabric can be handled in open width, the conventional open width padding technique is used. For fabrics which cannot be handled in this way, rope padding or immersing in the liquor in winch machines followed by centrifuging is a satisfactory alternative.

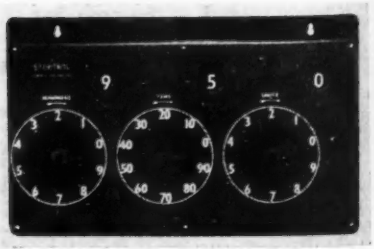
For heavy mesh fabrics—such as shoe fabrics—which are padded in open width, it is advisable to have some means of removing excess liquor from the interstices of the fabric immediately after padding to avoid "windowing": a suction slot, compressed air, or mechanical shaking are suggested. It is recommended that lightweight fabrics are stiffened after setting. Heavy shoe fabrics can be stiffened and stabilised in one operation—curing of the resin at 266°-302°F. (130°-150°C.) for 5-3 minutes is normally adequate to stabilise these fabrics.

New Controlling Device

ONE method of keeping a check on stocks of items which are constantly drawn upon is provided by the Stoktrol, which in effect is a subtracting machine made by K. Bisset and Co. Ltd., 145 Grand Buildings, Trafalgar Square, London, W.C.2. The standard machine has three large dials and the stock in hand is shown on three oval "windows" at the top of the machine. As stock is issued, the quantity is "dialled" by a stylus on the three dials (for hundreds, tens and units, respectively). Remaining stock is shown in the windows.

Apart from stock control, the machine could be used for batch counting. As items pass along the production line, a figure would be dialled, and the result would show how many more items would be needed to make up a particular batch. Similarly, in production control, the target figure could be shown. As production proceeds, the numbers would be dialled, thus showing the balance required at any particular time.

The machine is fully automatic, and no mental calculations are involved. The capacity is 1,000, but models can be produced to deal with higher figures. The machine can also be supplied to add instead of subtract.



TEXTILE MACHINERY and MILL EQUIPMENT NEWS

The Williams-Sellers Combined Milling and Scouring Machine

A 60 ins. machine is capable of doing the work of at least one ordinary scouring machine, two wringing machines and two to three milling machines

By D. R. H. WILLIAMS, C.B.E., F.T.I., M.INST.FUEL

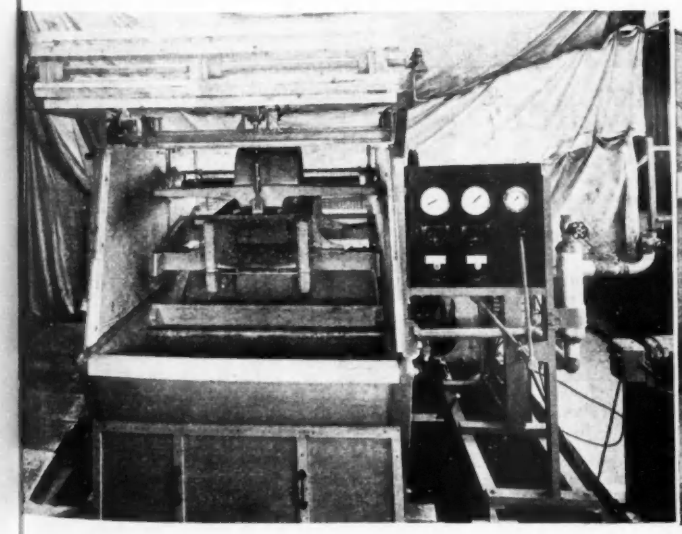
JUST over a year ago I described (*T.M.*—Dec., 1956) how I had one of my 48 ins. combined machines rebuilt and brought up to date by the substitution of compressed air cylinders for the original levers and weights method of controlling the pressure exerted on the top roller and the trough lid. After running the machine on various fine worsted cloths, both clear cut and milled finish, for several months, I was so pleased with the result that I had a second combined machine and a 60 ins. scouring machine rebuilt in the same way. That was three months ago. The results have been so satisfactory that I am having my third combined machine and my other scouring machine dealt with similarly.

We find that our cloths handle better and the bottom milling obtained in the combined machine is infinitely superior to the rubbed-up surface caused by the friction in the trough of the ordinary milling machine. Great care has been taken to remove all friction. As a result, hardly any flocks are made, and the cover is obtained by cloth pressing against cloth in the specially constructed adjustable trough. We have not had any machine marks at all from these combined machines. We used to get them in our 60 ins. scouring machine, but since we went over to compressed air we have not had any.

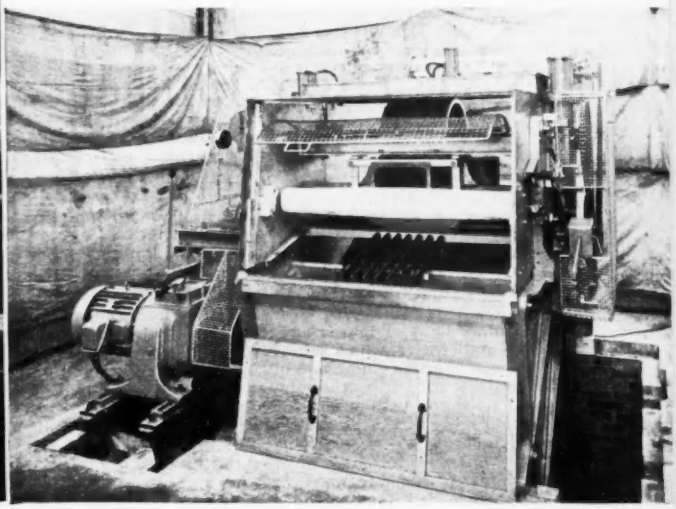
The illustrations are of a Williams-Sellers 60 ins. machine which has just been completed. The main features are briefly as follows:

(1) Rubber-covered top roller controlled by two compressed air cylinders.

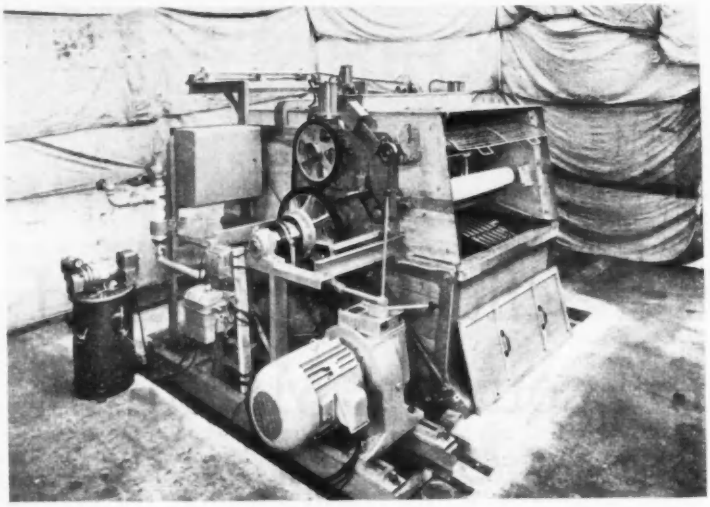
(2) Mintex-covered bottom roller running on ball bearings. Note—



Williams-Sellers combined machine. Front view, set for milling



A view of the combined machine from the back



A side view of the combined machine showing the motor driven compressor

Both rollers are driven by a Renold chain with compensator wheel, thus avoiding all possibility of the slipping caused by the ordinary belt drive, leading to bare patches and holes in the cloth.)

(3) The trough lid when set for milling is controlled by a compressed air cylinder working an adjustable lever which can be set to get the required angle of pressure. The lid is set close up to the top rollers and to the metal sides so as to prevent any possibility of the pieces getting trapped.

(4) As an additional safeguard, the stripper plate is controlled by micro setting and is usually about one thousandth of an inch off the bottom roller.

(5) Movable metal cheeks guide the pieces into the rollers and can be set to the required distance apart for scouring and for milling by hand-wheel and chain, a pointer on a scale showing the width apart in inches.

(6) The pieces are divided behind the rollers by stainless steel tubes, thus avoiding all friction.

(7) Safety guards and knock-off motion which can be balanced as required for different weights of cloth.

(8) A Cox steam and water mixer.

(9) A dial thermometer to indicate the temperature of the water as it enters the machine. This is of vital importance if effective washing-off is to be achieved.

The floor space occupied is about 9 ft. × 9 ft.

It should be pointed out that, both from the point of view of efficiency in production and capital cost, a 60 ins. combined machine is capable of doing the work of at least one ordinary scouring machine, two wringing machines and two to three milling machines. From the saving of time point of view, moving the pieces from one machine to another, including stitching, two men would have to work fast to get this done in an hour and a half. None of this extra work is required in the combined machine in which the pieces stay all the time.

In the illustration is shown the 15 h.p. two-speed motor to give 118 yds./min. for scouring and 15 yds./min. for wringing. We have found in practice we can do all the milling we require on our fine worsted cloths by closing the trough as for milling whilst we lather up, using the appropriate settings. This cuts out the necessity of gauging accurately the amount of water left in the piece after wringing. So many millers fall down on this. Instead of milling their pieces in a thick creamy lather, they run them in a sloppy mixture of soap and water which causes the milling to take very much longer and leads to large quantities of flocks.

Finally, I would point out to all those who are interested in the application of scientific research to the wool textile industry, an interest that is daily becoming more and more important, the removal of the warm pieces on to a cold floor kills the state of plasticity which is a vital factor in successful milling and puts at least another half-hour on to the milling process.

New High Efficiency Water Meters

A NEW class of trade water meters known as the "Compound," for measurement of widely varying cold-water flows, is announced by George Kent Ltd., Luton, Beds. Pointing out that this "Compound" meter, which supersedes the well known "Torrent Combination" meter, the company state that it combines long life and reliability with an extremely wide measuring range, which in the case of the 3 ins. is said to be over 500 : 1 within accuracy limits of 2%. To achieve this, two completely separate measuring units are used, one for high and the other for low flows, both of which, with an automatic change-over valve to select the unit required, are contained in a single compact meter body. Only one measuring unit can register at a time. Embodying many recent improvements in materials and design, both from research and the company's experience in the field of water measurement, the "Compound" achieves a very high standard of performance and quality. Other features to which the makers draw attention include :—

(1) Absence of any external piping simplifying installation and maintenance.

(2) Manufactured in 3-in. and 4-in. pipeline sizes (75 and 100 mm.).

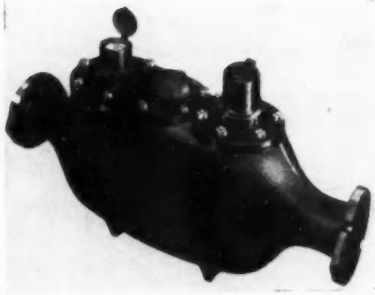
(3) Uses established Kent measuring units, all components being completely interchangeable.

(4) Improved automatic change-over valve with instantaneous action—simple, rugged and frictionless.

(5) All parts easily removed for servicing.

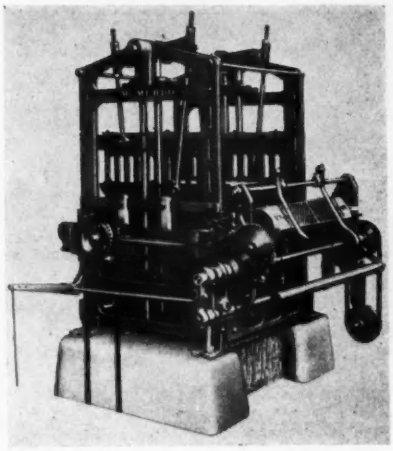
(6) Higher working pressures.

(7) Extensive use of durable, corrosion-resisting materials, ensuring longest working life and low maintenance costs.



The 3 ins. size "Compound" water meter

Features of a New Double-Lift, Single Cylinder Jacquard



The new open-shed, single cylinder jacquard

A NEW jacquard of the single cylinder type, recently announced by Peter Walker (Blackburn) Ltd. and James McMurdo (Manchester) Ltd., incorporates several extremely interesting features. The machine, streamlined on modern lines, is built on sound engineering principles and one of its main features cited by the makers is that it is a simple and efficient "open shed" jacquard of an entirely new type. The hooks, double headed (made out of one length of wire) are all one hand, but instead of the base of the hook resting on the wood of the cord board when in the down position, they rest on two round steel bars, spaced only wide enough for the cord to freely slide through and be about 2 ins. above the upper side of the board, and the cords which can be tied to the hook bottom pass through the space between the bars, and deflect alternately when passing through the staggered holes of the cord board. It is pointed out that not only does this method obviate using right and left hand hooks, but it keeps all the hooks that are down in a perfectly straight line, and also makes the use of loops and links unnecessary.

The jacquard is a double-lift, single cylinder machine but the wirework has been specially designed for open shed weaving and it is claimed that no strain is put on any of the hooks at all. Although knives of the shallow type are used, jumping-off and crowning of the hooks stated to be a thing in the past; in fact, the press on the needles is no harder than required by a double cylinder machine. The cylinder movement, reduced to a minimum, is no more than 1 $\frac{5}{16}$ ins., based on the principle that the smaller the movement the slower the press on the needles. To eliminate the risk of the point of the needles catching the cards when the cylinder is on the turn, a special protection plate has been designed and effectively achieves its purpose.

The makers say that one of the questions often asked regarding open shed weaving concerns when the loom is stopped for the night and the warp threads open, would certain kinds of warp suffer from this strain and on resumption of weaving the following morning give rise to a bad starting place. This fault, they say, has been neatly overcome by a lever at the front of the jacquard carrying a cord down to the weaver, which when pulled (the sley first being put at back centre) locks *for one pick only*. As the sley comes towards front centre, all hooks in the raised position close, as in the case of the ordinary jacquard, but on starting the loom (no further action being required by the weaver) the jacquard commences to weave on the open shed principle. This arrangement is also useful when an end requires drawing-in. Some of the features claimed for "open shed" weaving include (*a*) much greater life given to both harnesses and wirework, (*b*) designs can be woven either side up, (*c*) absence of "swing" below the comberboard and (*d*) less warp breaks.

Rapid Yarn Tension Measurements

THE new Saxl tension meter recently announced by Tensitron Inc., Harvard, Massachusetts, U.S.A., adds the feature of quick, automatic trigger action to the measurement of tension during yarn processing. The makers state that due to the negligible yarn contraction it is now possible to make measurements of yarn tension and rubber strands for example in narrow-fabric looms. The rigid aluminium body solidly supports the trigger mechanism and the precision movement. The black, plastic sides, custom moulded to fit the central housing, reduce the weight and increase the shock resistance of the instrument.

Latest Saxl meter

To operate the tension meter, the trigger is cocked like that in a gun and this opens the 3-roller mechanism for yarn insertion. The yarn is placed upon the two outer rollers recessed into the plate so that the yarn cannot get caught at the back of the pulleys. Upon release of the trigger the yarn slips automatically into the wheel grooves. The centre roller deflects against the restraint of a calibrated spring of special construction. This motion is mechanically amplified over a gauge movement. Thus, on a dial facing the observer, the tension of the material shows directly. The distance the centre roller is lifted is only a fraction of an inch and, it is pointed out, this practically eliminates yarn contraction between the rollers even if the free distance in which the instrument can be inserted is limited. A transparent flywheel mounted on the pivot, steadies the readings to give smooth averaging of all practical conditions encountered.

Tentative Textile Standard No. 48

A "Method for the Quantitative Chemical Analysis of Binary Mixtures of Polyamide Fibres and Certain other Fibres" is announced by the Textile Institute in Tentative Textile Standard No. 48, 1957. The method has been selected as one giving the most reproducible results, following collaborative work carried out in several laboratories. The principle of T. T. S. No. 48 is that polyamide fibres are removed from the mixtures by dissolving in 80% formic acid. The residue is collected, washed, dried and weighed; its weight is corrected, where necessary, for loss in the solvent, and expressed as a percentage of the weight of the mixture.

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Improving the Textile Qualities of Cotton

Discovery of a new chemical reactivity of the cotton fibre must always be a matter of great importance since from it can arise investigations capable of establishing new methods for increasing the usefulness of this versatile fibre

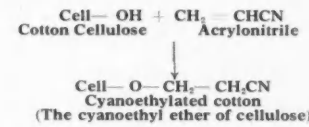
By B. C. M. DORSET

WHILE synthetic fibres such as nylon, "Terylene," and "Orlon" have outstanding properties it must not be thought that cotton as a textile fibre is "on the way out" since the facts of the case are entirely otherwise. Yet it must be admitted that it would be very acceptable if instead of cotton having just a wide range of very serviceable properties able to ensure that its behaviour under widely varied conditions was satisfactory it could be given one or two superlative properties in addition to those properties which it normally possesses. It would, for example, extend the usefulness of cotton goods if they could be given increased resistance to deterioration by say acids, heat, and attack by micro-organisms, or if they could have their dye receptive properties modified either to allow a wider range of dyes to be applied or to give dyeings of enhanced fastness. Already various treatments for cotton goods have been devised to make them more useful. The treatments with resins to confer resistance to washing shrinkage and to creasing are notable examples of the kind of improvement which is desired. Progress in the same direction has also come from partial esterification to make cotton more resistant to heat and to micro-organisms while cyanoethylation is at the present time being exploited with a view to giving cotton increased general durability coupled with improved dyeing qualities.

In reviewing the above methods for improving cotton it becomes evident that cotton is a reactive fibre towards activated olefinic compounds (such a compound is typified by the acrylonitrile used for the cyanoethylation of cotton) and this newly recognised reactivity is most important. Looking back some sixty or more years it can be seen how Cross and Bevan established the viscose rayon industry by recognising that cellulose cotton could be looked upon as an organic alcohol and thus be expected to react with carbon disulphide to form a xanthate. The discovery or the recognition of a new chemical reactivity of the cotton fibre must always be a matter of great importance since from it can stem research and investigation capable of establishing new methods for increasing the usefulness of this fibre. The view is taken that the newly discovered reactivity of cotton cellulose towards a considerable number of olefinic compounds will now stimulate very profitable research.

It has previously been noted in these articles that the U.S. Dept. of Agriculture actively supports research at the Southern Regional Research Laboratory in New Orleans in various methods for modifying cotton to extend the uses of this fibre. Partial acetylation and cyanoethylation processes have been strongly sponsored up to the stage of pilot plant trials and the results are encouraging. Cyanoethylation is based on the reaction of cotton with an activated olefinic compound—acrylonitrile. But the time has now come for an examination of a much wider range of such reactive compounds in order that a few of the more promising ones may be more intensively investigated. Research along these lines has recently been carried out in the laboratory mentioned above and the very interesting results obtained have now been published by Frick, Reeves and Guthrie (J. Text. Research, 1957, **27**, 92). It would appear that acrylonitrile is only one of many such olefinic compounds which can be induced to combine with cotton and thereby modify its properties in various directions, and attention will now be drawn here to some of these.

Firstly it may be recalled that in the cyanoethylation of cotton with acrylonitrile the reaction which takes place can be represented thus:—



In this reaction, known as the Michael reaction (J. Prakt. Chem., 1887, **36**, 349), the acrylonitrile (the activated olefinic compound) adds on to the cellulose with a simultaneous movement of the hydrogen atom (of the cellulose hydroxyl group) to that carbon atom of the acrylonitrile which is linked to the nitrile (CN) group. The activation of the olefinic compound which allows this

Michael reaction is effected by having a basic catalyst present—in the cyanoethylation of cotton as now found most convenient it is usual to employ caustic soda as the catalyst but other alkaline substances may be used instead.

Acrylonitrile conforms to the general formula $CH_2=CHR$, where *R* in this instance is the nitrile group CN but which in other olefinic compounds conforming to the same general formula may be a ketone, ester, amide, nitroalkene or sulphone group. It would therefore seem possible for cotton to undergo the Michael reaction with all these different types of olefinic compounds and thus become modified as regards its properties in many different ways. There is thus the possibility of producing modified cotton fibres in which a proportion of the cellulose molecules have groups of the types: —COOR (ester), —COR (Ketone), $-CO.NH_2$ (amide), —CN (nitrile), $-NO_2$ (nitro), $-SO_2R$ (sulphone), etc. Such modification opens up very many opportunities to improve the textile value of cotton. But there is another point concerning this which is of importance—it is concerned with the degree of modification as controlled by the extent to which the olefinic compound is allowed to additively combine with the cotton fibre.

In its simplest terms the molecule of cellulose is represented by the formula $(C_6H_{10}O_5)_n$, which can be otherwise expressed as $[C_6H_7O_2(OH)_3]$ thus showing that there are three hydroxyl groups present in each anhydro-glucose, $C_6H_{10}O_5$, unit, The value of *n* in the above formula for cotton cellulose is usually very large so that the cellulose molecule can be regarded as being very long and linear and having attached to it at fairly uniformly spaced intervals hydroxyl groups (both primary and secondary in character thus differing slightly as regards their reactivity). Thus in applying to a cotton fibre an olefinic compound this may additively combine with almost any proportion of the hydroxyl groups available and in the event of this being a relatively small proportion the added olefinic groups may become regularly or irregularly spaced along the length of each cellulose molecules. There is also the possibility that the olefinic compound may combine preferentially with the primary rather than the secondary hydroxyl groups since it has been found that in some other cellulose reactions the primary hydroxy groups are more reactive. It is thus evident that a knowledge only of the exact amount of olefinic compound induced to combine with cotton does not necessarily allow one to anticipate accurately what will be the modification of its properties—the distribution of the olefinic groups along each cellulose molecule must also be taken into consideration. The distribution of the added olefinic groups will for example influence the resulting strength and elasticity of the treated cotton fibres since these added groups can influence considerably the degree of movement of the cellulose molecules relatively to each other when subject to stresses and strains. If the added olefinic groups are bunched together in large clusters at widely spaced intervals it is likely that they will lower the strength of the cotton fibre more than if they are uniformly spread along the cotton cellulose molecules.

In general, an olefinic compound of the type referred to above has an alpha-beta unsaturated linkage as shown in a typical formula, $CH_2=CHR$, which indicates its ability to enter into the Michael reaction and additively accept a hydrogen atom, but this reactivity requires to be stimulated by the presence of a catalyst. It is generally desirable also that the catalyst employed shall have no harmful effect on the cotton and that the amount of catalyst used shall be relatively small in amount. It may be recalled that a favoured catalyst for inducing cotton to enter into various reactions is caustic soda and thus for this purpose the cotton is often first treated with a concentrated aqueous solution of this alkali to convert the cotton into alkali-cellulose. This expedient is adopted, for example, in the manufacture of viscose (cellulose xanthate) and of carboxymethyl cellulose. The use of so high a proportion of alkaline catalyst is often undesirable since it can lead to the formation of cellulose derivatives which have lost their original fibrous structure. From the viewpoint of modifying cotton to improve its textile uses it is necessary to employ such conditions of treatment as preserve as completely as possible the cotton fibres in their original form. The general aim would therefore be to limit suitably the extent of the reaction with an olefinic compound and also the amount of catalyst used.

Treating Cotton Yarn or Fabric

In devising suitable conditions of reaction much will depend on whether or not the applied olefinic compound is water-soluble. If it is then this allows a simple treatment in which cotton yarn or fabric is impregnated with an aqueous liquor containing both the olefinic compound and the alkaline catalyst so that the fabric may then be dried and heated until the reaction is complete and then follow this by a washing or other treatment to remove all unreacted chemicals. If the olefinic compound is soluble only in organic solvents then either it must be applied to the cotton material in a medium largely consisting of the appropriate organic solvent or use must be made (if satisfactory) of an aqueous emulsion of the olefinic compound. There are alternative methods of treatment but undoubtedly it is a great advantage if the olefinic compound allows aqueous conditions to be employed.

In the investigations of Frick, Reeves and Guthrie the considerable number of olefinic compounds used are indicated in Table 1 together with their reactivity towards cotton under aqueous and non-aqueous conditions:—

Table 1

Water-soluble Compounds	Degree of Reactivity
Acrylamide	Extensive
N: N-methylenebisacrylamide	Able to modify dyeing properties
Acrylic acid	Able to modify dyeing properties
Maleic acid	Able to modify dyeing properties
Itaconic acid	Able to modify dyeing properties
Crotonic acid	No reaction
Fumaronitrile	Able to modify dyeing properties
Water-insoluble Compounds	
Methyl acrylate	Able to modify dyeing properties
Methyl methacrylate	No reaction
Mesityl oxide	No reaction
Crotonaldehyde	Able to modify dyeing properties
Dimethyl itaconate	No reaction
Diethyl itaconate	No reaction
N-tert.-butylacrylamide	No reaction
Ethyl alpha-cyanocinnamate	No reaction
m-nitrocinnamic acid	No reaction

In such investigations the catalysts employed were mainly caustic soda and also the strongly alkaline trimethylbenzylammonium hydroxide which latter substance is commercially available under the trade name of Triton B (Rohm and Haas). Although acrylamide, $CH_2=CH.CONH_2$, was found to be the most reactive towards cotton the smaller reactivity of some of the other olefinic compounds should not be overlooked since it is possible that modification of the conditions of their application might cause them to react more effectively. A few notes on these less reactive compounds might therefore be useful.

When cotton fabric was padded with an aqueous liquor containing 17·3% of sodium acrylate and 4·2% of caustic soda (the catalyst) and a trace of para-phenylene diamine (to prevent self polymerisation of the sodium acrylate) and afterwards dried and heated at 140°C. for 10 mins., the cotton was modified so that it acquired a much increased

affinity for the basic dye Methylene Blue. In the reaction involved one carboxyethyl group, $-CH_2.CH_2COOH$ becomes attached to each cellulose molecule at spaced intervals each of forty $C_6H_{10}O_5$ units—the carboxyethyl groups are thus very widely spaced.

It proved more difficult to attach methyl acrylate groups, $-CH_2=CHCOOCH_3$ groups and even more so methyl methacrylate groups, $-CH_2-C.CH_3COOCH_3$ to cotton. By contrast, maleic acid in the form of its di-sodium salt reacted steadily, the formula for this salt being—

$$\begin{matrix} CH-COONa \\ \| \\ CH-COONa \end{matrix}$$

so that groups of the following type became attached at spaced intervals along each cellulose molecule—

$$\begin{matrix} -CH.CH_2-COONa \\ | \\ COONa \end{matrix}$$

When cotton fabric was impregnated with an aqueous liquor containing 20·4% of di-sodium maleate and 4% of caustic soda and then dried and heated at 140°C. for 10 mins. one maleic acid group combined per 27 anhydroglucose ($C_6H_{10}O_5$) units along each cellulose molecule so that the cotton fibres not only acquired a strong affinity for Methylene Blue but they also resisted strongly the direct cotton dye Chlorantine Fast Blue 3GLL and showed a moderate affinity for the acetate dye Celliton Fast Yellow RRA. These modified properties were fast to boiling in a 5% solution of caustic soda.

Crotonic acid having the formula, $CH_3CH=CH.COOH$, is steadily acquiring a number of textile uses but has not been found reactive towards cotton under the conditions now being discussed. Fumaronitrile, $\begin{matrix} CH.CN \\ \| \\ CH\ CN \end{matrix}$ is only slightly reactive.

Itaconic acid and its esters, the former having the formula

$$\begin{matrix} CH_2 \\ \| \\ C.COOH \\ | \\ CH_2COOH \end{matrix}$$

are also gaining favour in the treatment of textile materials and it is therefore interesting to note that particularly itaconic acid strongly modifies the properties of cotton when applied along the same lines as described above for other olefinic compounds using an aqueous liquor containing 15% of itaconic acid and 6% of trimethylbenzyl ammonium hydroxide and following with drying and heating for 15 mins. at 145°C. The cotton is thus given a strong affinity for Methylene Blue and a strong resistance to direct cotton dyes. It is a somewhat curious feature that the catalyst trimethylbenzyl ammonium hydroxide cannot be satisfactorily replaced by caustic soda.

Treatment with Acrylamide

Returning now to a consideration of acrylamide it is of importance that this olefinic compound has strong reactive properties towards cotton as is evidenced by the fact that treatment of cotton fabric with an aqueous solution containing 12·5% of acrylamide and 3·8% of caustic soda followed by drying and heating for only 6 mins. at 125°C. leads to combination of one carbamolethyl group of the type $-CH_2.CH_2.CO.NH_2$ per 5·7 anhydroglucose units in each cellulose molecule. The resulting cotton fabric has a strong affinity for Methylene Blue which is increased rather than decreased as a result of soaking the modified cotton fabric for three days in a 0·5% solution of caustic soda.

The ready combination of acrylamide with cotton in the presence of the activating catalyst caustic soda is a matter of considerable importance since if such modification of cotton could be made commercially satisfactory at reasonable cost it could have far reaching effects on the usefulness of cotton. Acrylamide is a basic substance and if combined with cotton it should give this fibre wool-dyeing properties. For over half a century attempts have been made to devise a satisfactory method for the so-called aminisation of cellulose fibres so that they might have wool-like properties and allow cotton to be used in place of wool. All of the methods investigated have as their main inspiration the fact that wool has a basic character which enables it to be dyed with a wide range of readily available dyes and that such basicity can also promote a desirable warm handle. Thus aminisation processes have usually involved the reaction of the cellulose fibre with a substance containing basic groups such as amino (NH_2) groups. Hence the importance attached to acrylamide which is basic and could easily prove to be ideal for use in the aminisation of cotton and regenerated cellulose fibres. It may be recalled that acrylamide has been employed as a component of acrylonitrile copolymers with the aim of improving the dyeing properties of such fibres as "Orlon" and dynel which are based on polymeric substances containing a high proportion of acrylonitrile and which have therefore proved difficult to dye with ordinary dyes when using conventional dyeing methods and equipment. With these facts and considerations in mind, Frick, Reeves and Guthrie (J. Text. Research, 1957, **27**, 294) have devoted special research to the treatment of cotton with acrylamide to effect the so-called "carbamoylethylation" (comparable to cyanoethylation) of this fibre and some very interesting results have been obtained. But before dealing more closely with these some reference ought to be made to acrylamide itself.

In the first place it now seems to be generally recognised that acrylamide is a new and versatile monomer and chemical intermediate which is already finding many uses especially in the preparation of polymeric products. It was first prepared and described by Moureau in 1893 and he made it by reacting acrylyl chloride with ammonia in a cold benzene solution. The reaction takes the following course:—

$$\underset{\text{Acrylyl chloride}}{CH_2=CHCOCl} + NH_3 \longrightarrow \underset{\text{Acrylamide}}{CH_2=CH.CONH_2} + HCl$$

In a somewhat similar manner acrylamide can be made by reacting ammonia with acrylic anhydride. Alternatively acrylamide can be made by dehydrating betahydroxypropionamide by heating this in the presence of anhydrous sodium carbonate at about 155°C. thus:—

$$\underset{\text{Beta-hydroxypropionamide}}{CH_2.CHOH.CONH_2} \xrightarrow{\text{Dehydration}} CH_2=CH\ CONH_2$$

By this method an 80% yield of acrylamide can be obtained.

The technical preparation of acrylamide appears to favour a reaction in which acrylonitrile is hydrolysed with concentrated sulphuric acid (sulphuric acid mono-hydrate is generally used). This reaction is a general one for organic nitriles and it is in the first stage of hydrolysis where the amide is formed by addition of water as shown below:—

$$\underset{\text{Acrylonitrile}}{CH_2=CHCN} \xrightarrow[\text{Hydrolysis}]{\text{Acid}} CH_2=CHCONH_2$$

The various manufacturers of acrylamide adopt different procedures for extracting the acrylamide from the sulphuric acid in the reaction product. Thus in an I.G. process

(Ger. P., 662,694) the sulphuric acid is removed by precipitation as calcium sulphate while in an American Cyanamid process (B.P. 631,592) the acrylamide is extracted with non-aqueous solvents such as isopropanol. Several other methods for isolating the acrylamide have been described. Acrylamide is a white crystalline solid which is very soluble in water and methyl alcohol is also freely soluble in acetone and ethyl alcohol. It has a melting point of 84·5°C.

It is possible to react acrylamide with cotton in several different ways but for the purpose of assessing the usefulness of carbamoylethylated cotton Frick, Reeves and Guthrie used a method in which cotton fabric is impregnated with an aqueous liquor containing acrylamide, and a small proportion of an alkaline catalyst followed by a heat treatment to bring the reaction to completion. The important point concerning this method is that it leaves the treated fabric in such a state that it is useful for textile purposes, i.e., it is not stiffened and it retains most of its original strength while possessing new dyeing properties. As a result of such carbamoylethylation the new chemical composition of the cotton fibres is best represented by the formula—

$$[C_6H_{10-m}O_{5-m}\ (O.CH_2CH_2CONH_2)m]_n$$

where *m* represents the number of acrylamide groups introduced per anhydro-glucose unit of $C_6H_{10}O_5$.

Caustic soda and trimethylbenzyl ammonium hydroxide were the catalysts used. Although the latter catalyst appears to be somewhat more efficient from a consideration of the molecular proportions employed the much lower molecular weight and the cheapness of caustic soda indicates this to be the catalyst most likely to be employed in large scale operations.

The data in Table 2 illustrate certain essential features of the reaction between purified and hydrogen peroxide bleached cotton fabric and acrylamide:—

Table 2

Composition of Aqueous Liquor Applied to Fabric			Heating Conditions:		Combined Nitrogen of Carbamoylated Cotton	Efficiency of Treatment	Retention of Tensile Strength
Acrylamide	Caustic soda (S) of Triton B (T)	Liquor Pick-up	Temperature	Time			
48%	4% S.	81%	125°C.	4 min.	2·21%	27·6%	93%
25%	4% S	84%	125°C.	4 min.	1·60%	38·7%	—
25%	4% S	80%	125°C.	4 min.	1·70%	43·2%	92%
25%	5% S	82%	115°C.	10 min.	1·17%	29·0%	84%
25%	10% S	90%	115°C.	10 min.	0·89%	20·0%	85%
25%	5% T	72%	115°C.	5 min.	0·98%	26·5%	95%
25%	5% T	70%	115°C.	10 min.	0·72%	20·8%	99%
48%	15% T	76%	115°C.	5 min.	2·22%	30·9%	—

A first inspection of the above data shows that a heating of the impregnated fabric at 115 to 125°C. for about 5 mins. is generally sufficient to effect satisfactory carbamoylethylation with a high retention of the original tensile strength of the fabric. The proportion of combined nitrogen in the carbamoylethylated cotton fabric ranges from 1 to 1·5% but can attain 2%. A significant feature however is that only about 25% of the total amount of applied acrylamide enters into combination with the cotton or, otherwise expressed, the chemical cost is about four times greater than would be the case if all the applied acrylamide could be made to combine with the cotton. Obviously there is room for improvement either by way of using a more efficient catalyst or by suitably changing the conditions of the reaction.

In effecting the carbamoylethylation of cotton along the lines indicated above attention has to be given to the possibility of the acrylamide undergoing hydrolysis of the following type—

$$\underset{\text{Acrylamide}}{CH_2{=}CH\,CONH_2} \longrightarrow \underset{\text{Acrylic acid}}{CH_2{=}CH\,COOH}$$

Such hydrolysis during the reaction could give free acrylic acid capable of combination with the cotton fibres simultaneously with the similar combination of the unchanged acrylamide. There is also the possibility that some of the carbamoylethylated cotton might suffer similar hydrolysis thus—

$$Cell{-}O{-}CH_2.CH_2CONH_2 \longrightarrow Cell{-}O{-}CH_2.CH_2COOH$$

It has been established that these hydrolytic changes do actually occur but if the concentration of caustic soda (catalyst) is kept below about 2% then they occur only to a small degree and may be disregarded.

Carbamoylethylated Cotton

At the present time progress in the carbamoylation of cotton has been developed to the stage of erecting a small pilot plant thus enabling carbamoylethylated cotton fabric to be produced and its properties evaluated. In one particular experiment, a 10 yd. length of cotton sheeting was padded with an aqueous liquor containing 50% of acrylamide and 4% of caustic soda, under conditions arranged to ensure a liquor pick-up of 89%. A similar length of cotton sheeting was similarly padded with a liquor containing only 4% of caustic soda. The two fabrics were together drawn through a heated chamber so as to be exposed to a temperature of 135°C. for 4 mins. Thereafter the fabrics were thoroughly purified by hot and cold washing. It was found that the carbamoylethylated fabric contained 2·39% of combined nitrogen and had an increased weight of 10·9% so that there was present one carbamoylethyl group per three anhydroglucose units.

Examination of the two fabrics in comparison with untreated fabric provided much useful data, some being summarised in Table 3.

Table 3

	Carbamoylethylated Fabric	Caustic Soda Treated Fabric	Untreated Fabric
Fabric weight	5·76 lbs.	5·11 lbs.	4·77 lbs.
Strip breaking strength (warp × weft), lbs.	50·9 × 43·1	52·9 × 49·1	58·0 × 46·7
Extensibility at break (warp × weft), %	8·7 × 25·1	8·3 × 29·5	64 × 21·3
Elmendorf tear strength (warp × weft), lbs.—			
A	3·3 × 2·4	4·3 × 3·5	4·7 × 3·8
B	2·6 × 2·0	3·2 × 2·7	3·2 × 2·5
Trapezoid tear strength (warp × weft), lbs.—			
A	5·5 × 4·6	7·0 × 5·9	6·3 × 5·5
B	5·5 × 5·0	6·4 × 7·0	6·6 × 5·5
Flat abrasion, number of rub cycles—			
A	177	214	188
B	144	94	94
Flex abrasion, number of rub cycles—			
A	451 × 426	1223 × 1008	843 × 754
B	239 × 195	197 × 191	151 × 154
Stiffness (warp × weft) bending force	9·2 × 3·7	7·7 × 3·4	8·6 × 2·9
Crease resistance (warp × weft)	49·9 × 42·0	45·1 × 43·0	46·3 × 43·2

Note: A—Before laundering. B—After 10 laundering treatments.

It is evident that while the carbamoylethylated cotton fabric is not appreciably stiffened in comparison with the untreated fabric it does have a lowered tear strength and flex abrasion resistance. But it is most interesting that if the carbamoylethylated fabric is laundered ten times the flex abrasion resistance is then superior to that of the untreated fabric after similar laundering. In the same way the Elmendorf tear strength of the carbamoylethylated fabric is less affected by laundering then is that of the alkali-treated and the untreated fabrics.

Carbamoylethylation improves the resistance of cotton to deterioration during exposure to high temperatures and while this improvement is quite useful it is not so great as the improvement effected by a comparable degree of acetylation as the data given in Table 4.

Table 4

Treatment of Fabric	% Retained Strip Breaking Strength (warp) after Heating at 160°C. for 1 day	7 days
Carbamoylethylated fabric	83	56
4% caustic soda only	84	38
Untreated fabric	77	32
Cyanoethylated cotton fabric	90	49
Partially acetylated (7·5% acetyl)	70	26
Partially acetylated (16·5% acetyl)	100	80

Just as the higher acetylation of cotton fabric much improves its heat resistance so might a higher degree of carbamoylethylation be more beneficial than as indicated above. Cotton fabric which has been carbamoylethylated shows considerably improved resistance to rotting in soil burial tests—the fabric shows no sign of disintegration after burial for seven days whereas untreated fabric is completely disintegrated. The dyeing properties of the carbamoylethylated cotton are interesting in so far as they reveal an increased affinity for vat dyes but these dyeing properties must be considered in relation to the stability of the carbamoylethyl groups. It has been mentioned above that caustic alkalis are able to hydrolyse these groups so that the amide ($CONH_2$) group becomes a carboxyl (COOH) group thereby giving the cotton acidic instead of basic properties. This is a fundamental change capable of modifying very much the affinity of the carbamoylethylated cotton for the various classes of dyes. It is therefore generally desirable that the carbamoylethylated cotton should be reasonably stable to alkaline hydrolysis—it should not be affected, for example, by ordinary scouring, bleaching, and laundering operations. On the other hand, it can be visualised that at times it might be desirable to hydrolyse the carbamoylethylated cotton to a suitable degree in order to secure new properties in the cotton.

Experiments have shown that repeated laundering of the carbamoylethylated cotton up to fifteen times using a detergent liquor containing 0·5% of soap and 0·2% of sodium carbonate has practically no hydrolytic action. If the carbamoylethylated cotton is boiled for thirty minutes in a 5% aqueous solution of caustic soda then hydrolysis definitely occurs—approximately 70% of the carbamoylethyl groups are changed to acrylic acid groups and completely split off at their ethyl linkage with the cellulose so as to give regenerated cellulose fibres. However, no appreciable hydrolysis takes place during the dyeing of carbamoylethylated cotton with vat dyes although the dyeing conditions are definitely alkaline.

The carbamoylethyl group may be changed to another basic group—the aminoethyl ($— CH_2CH_2NH_2$) group—by treating the carbamoylethylated cotton with sodium hypochlorite solution and if the conditions of treatment are suitably chosen the change involves only a 15% reduction of tensile strength. The resulting aminoethylated cotton is basic and has wool-dyeing properties as shown by its strong affinity for the acid wool dye, Kiton Fast Red 3GLL. From all that has been stated above it is evident that carbamoylethylation is now an alternative to cyanoethylation and acetylation as a means for modifying ordinary cotton. Actually carbamoylethylation is a specially selected treatment taken from the wider range of treatments based on the application to the cotton of olefinic compounds having an alpha-beta unsaturated linkage as indicated by the general formula, $CH_2 = CHR$. The preliminary investigations so far made in this field indicate exceptionally varied possibilities able to render cotton much more useful as a textile fibres.

New Research Publication

SCHUSSFADENSPANNUNGEN BEIM WEBEN. (Weft Tension During Weaving). Published by the Institut f. textile Messtechnik, M. Gladbach. Forschungsbericht No. 379. Westdeutscher Verlag Köln & Opladen. (price DM 18.60).

This investigation concerns the extent and variation of weft tension as a function of various types of cop and cop sizes, taking into account also the influence of different shuttles and thread brakes. The tests covered tubular cops, coplike weft bobbins with short conical tube, bobbins on continuous tubes with or without conical base, and automatic bobbins. Yarns made from flax, cotton and viscose rayon were used. The diagrams show that with tubular cops and coplike bobbins the thread tension remains constant from beginning to end of drawing-off. Tubular cops, however, develop loops. Bobbins on continuous tubes give rise to typical increase of tension towards the end of drawing-off, specially if no conical base is used. Irregularities in the yarn can cause excessively high tension peaks. The length of the yarn bulk has no effect in the case of tubular cops but with long bobbins on tubes a great increase of tension occurs.

The diagrams also show the advantages and faults of various shuttle linings and thread brakes. Stroboscopic tests made visible the exit of the thread balloon and determined its extent, so that suggestions could be made how to prevent this occurrence. The advantages of tubular cops in respect of large yarn bulk and advantageous thread tension make it desirable to look for possibilities of retaining this type of cop even after automatisation of the looms. They possess, however, the disadvantage that the large yarn bulk, and as a consequence, the considerable variation in shuttle weight during drawing-off can influence the quiet and smooth running of the loom. The same applies of course to other bobbins of the larger type. B.S.

A Modern Warping Installation

Part of an installation of nine Benninger high efficiency warping machines recently installed at British Nylon Spinners Ltd., Pontypool, for the preparation of nylon warps up to 120 ins. wide

Trends in the Development of Azoic Dyestuffs

IN considering the trends in the development of the field of azoic dyestuffs, attention should be paid to (*a*) the contribution of the dyestuff manufacturers by the development of new products and (*b*) the contribution of both dyestuff manufacturers and dyestuff users in the methods of application of these products, said Dr. M. Huckel, Dipl. Ing. (Farbweke Hoechst. Frankfurt) in a recent address to the Manchester Section of the Society of Dyers and Colourists. The tendency nowadays, he said, was to feel that all the simple coupling components and diazo components had been exhausted, and the newer products all seemed to have larger molecules and were more complicated to produce commercially. However, new products were continually being produced to fill gaps in the colour range. Dr. Huckel did not think the end of the range of either coupling or diazo components was yet in sight but, undoubtedly, the products themselves could only become chemically more complicated than the earlier members of the series.

The principles of the impregnation stage of the process had changed relatively little over years and presented less problems than the development process. The practical dyer knew that the coupling components of medium and high substantivity were better suitable for dyeing in long liquor ratios, whereas Naphtol AS brands of low substantivity were primarily utilised on the pad. The experience of the last few years had, however, shown that this classification was partly antiquated as, under suitable conditions, even coupling components of low substantivity could be dyed in long liquor ratios, and Naphtol AS brands of high substantivity could be applied on the padding machine. Naturally this was of considerable practical value to the dyer as he could extend the range of what could be considered usable Naphtols in his particular field.

The results of experimental work were discussed by Dr. Huckel, and he observed that new possibilities had been opened up to continuous dyeing. Recently, many dyers had, in fact, produced by padding techniques fashion shades with Azoic dyestuffs, even in those cases where these shades could only be obtained by using higher substantive Naphtol AS brands. Considering the developing of these dyestuffs, the speaker said that one of the most important developments had been in the study of buffers, and the realisation that there was no universal buffer, but that the buffer must be selected to deal with the specific requirements of the diazo components. In recent years, the use of phosphate buffers had become very popular. From the practical point of view, the correct adjustment of the phosphate buffer was easily controlled by the use of pH paper. If during the development the pH value was too high, the percentage of monasodium phosphate must be increased. In the reverse case, when the developing bath was too acid, the quantity of disodium phosphate was raised.

The normal Naphtol AS methods of application to cellulosic fibres were unsuitable for the dyeing of synthetic fibres. Consequently the azoic technique had had to be adapted to the properties of the synthetic fibres which were naturally very different from those of the cellulosic fibres. The so-called "modified azoic technique" was therefore developed.

There were a number of components in the Naphtol AS range, as well as some products chemically related to those components, which had properties very similar to those of the non-ionic dyestuffs. Under suitable conditions they were absorbed from aquious dispersions by the synthetic fibres, and were combined on the latter forming larger dyestuff molecules. This could take place in principle in two different ways: method one used mixtures of coupling and diazo components in the form of their free bases, which were brought on to the fibre in one or in two separate baths at temperatures either below 100°C. or above 100°C. according to the fibre, and were then diazotised on the fibre with solium nitrate and sulphuric acid.

Method two utilised mixtures of coupling and diazo components in the form of their stabilised diazo compounds. However, it had been found possible to produce certain stabilised diazo compounds which went on to the fibre in one bath together with the coupling component. They could be applied at temperatures either above or below 100°C. according to the fibre in question, and by the action of acid the diazo compound was split and coupling took place on the fibre. The dyeing was then after-treated in the normal manner. This group of dyestuffs, sold under the designation Ofna-perl salts were suitable for the dyeing of polyamide and cellulose acetate fibres. Polyacrylonitrile fibres and the respective copolymers could so far not be dyed satisfactorily according to the modified azoic technique. An exception was "Acrilan," on which very promising dyeing tests with Ofna-perl salts had been carried out in the laboratory.

Industrial Uses of Yarn

INDUSTRIAL fibre uses had increased enormously during the last decade and new products had tended to use the new fibres, e.g. glass fibre laminates, said Mr. R. S. Goy, B.Sc. (manager, Applied Section of the Textile Research Dept., Dunlop Rubber Co. Ltd.) in a recent address to the Liverpool Section of the Textile Institute. A considerable advantage of cotton in applications such as hose and belting, he said, was its ability to stick to rubber without treatment. Dipping processes on thick ducks and canvasses were extremely difficult to apply. Thus, applications of some of the new fibres such as nylon and "Terylene" tended to be as blends with cotton either in the yarn, cord or weave. Six properties required of a fibre for use with rubber were:—

(1) Strength to resist applied load.
(2) Stability over a period of time.
(3) Maintenance of properties under service conditions.
(4) Adhesion.
(5) Flexibility.
(6) Cost.

Strength was a very important point and full fibre strength could be realised in applications such as belting and hose, but in tyre cord a high twist was used to prevent fatigue failure and this reduced strength. Many techniques of doubling had been tried, such as the Parker pig-tail and 2 in 1 twisters such as Fabelta and A.K.U spindle, which all gave improved cord strength, but the important requirement was strength in the finished product and initial strength differences tended to level out after dipping, calendering or vulcanisation. Test data was given to support this, which showed an increase of over 2 lbs. in breaking strength for a 3/1180 den. cord and a considerable reduction in variability over a period of years.

Nylon had most of the desirable properties except dimensional stability, stated Mr. Goy, and a discussion followed on the mechanism of the hot-stretch process designed to improve this. Microphotographic evidence was produced to show that considerable inward pressure was exerted on a cord when hot-stretched (approx. 10,000 p.s.i.) and this distorted the filaments. This and further tests on yarn extensibility in the cord led to the postulation that the hot-stretching process was in part a recrystallisation with some twist setting and mechanical locking of the foldings.

In conclusion, Mr. Goy said that two interesting new developments were:—

(1) Use of lightweight proofed nylon fabrics for making air-houses, portable warehouses, etc. These could be kept inflated to withstand severe weather condition with a pressure only slightly above atmospheric.
(2) Development of air springs for automobiles was likely to bring about revolutionary changes in tyre design.

No longer would the tyres have to perform the dual function of good driving properties and at the same time act as an integral part of the suspension system. With air-springs, made of two-ply nylon/rubber fabric, which automatically compensated for load and absorbed both high and low frequency vibrations, the tyre designer could concentrate on long life, good cornering, true running, road holding, etc.

Assessment of the Dyeing Characteristics of Wool Dyes

SPEAKING recently to the West Riding Section of the Society of Dyers and Colourists on new methods for assessment of the dyeing characteristics of wool dyes, Dr. H. R. Hirsbrunner (Geigy Company Ltd.) began by reviewing the methods of assessing the dyeing characteristics of wool dyes mainly used today. Although by no means the only factors which control the dyeing operation, the ones usually assumed to be of the greatest importance were:—

(1) Rate of strike.

(2) Migration.

Since the majority of the experimental work carried out had been done using level dyeing acid dyes, there had been a tendency to regard migration as the most important factor. The industry as a whole was, however, turning from the level dyeing acid dyes to the fast to washing dyes for many purposes and, except for the chrome dyes where a separate developing process was carried out at a later stage, fast to washing shades could not be achieved with dyes of good migration. Their primary interest, said Dr. Hirsbrunner, had therefore been in examining carefully the rate of strike of the acid and pre-metallised dyes which possessed low migration. Two additional tests had been used in their laboratories for some time.

(1) In the shading test, three samples of a tightly woven wool serge, the seams of which had been frayed open, were entered into a boiling blank dyebath set with the same dyeing assistants as used in practical dyeing, and treated for 15 mins. 0·05 to 0·1% of dye was then added and the three samples were dyed for 2, 5 and 15 mins. respectively. If the edges were dyed to a similar depth to the whole surface, the dye was said to be suitable for shading at high temperatures. If the frayed edges were much darker than the remainder of the serge, the dye was said to be unsatisfactory for this purpose.

(2) In the test for the acid requirements of a dye, four samples of wool serge were dyed successively for 15 mins. in the same dyebath at the boil. The first dyeing was carried out neutral, the second and third with the addition of 1% acetic (40%) and the fourth with 1% formic acid (85%), each addition of acid being made before commencing the successive dyeings. By visual examination of the colour yield of the four successive dyeing, it was possible to place the dye in one of three categories:—

(1) Those exhausting adequately under neutral conditions, e.g. Irgalans.

(2) Those exhausting adequately under slightly acid conditions, e.g. Irganols.

(3) Those requiring acid or formic acid for exhaustion, e.g. mainly acid milling dyes.

This test was very useful when examining mixtures of dyes to determine their compatibility.

One fault with these methods of test was that the degree of circulation in the dyebath depended on the human factor. This was not very satisfactory since the degree of circulation had a considerable effect on the rate of strike. For this reason, they had devised a further test where mechanical agitation was used. The time of half dyeing at 90°C. at pH7 was determined for a range of Irgalan, Irganol and Polar dyes by using this apparatus, and the results appear in the following Table 1.

Table 1

Neutral Drawing Test at 90°C. (194°F.) at pH7

Irgalan

Dyestuff	% Exhaustion
Yellow GL	35
Yellow 2RL	62
Orange RL	61
Red 4GL	36
Red 3G	64
Red 2BL	47
Rubine RL	57
Bordeaux 2BL	70
Violet 5RL	51
Violet 4BL	53
Brown Violet DL	58
Blue GL	65
Blue RL	45
Brown 2GL	56
Brown FL	45
Brown 2RL	52
Dark Brown 5R	75
Brown 7RL	74
Brown 3BL	52
Brilliant Green 3GL	34
Grey BL	48
Olive BGL	55
Navy Blue 5RL	41
Black RGL/GBL	23

Polar

Dyestuff	% Exhaustion
Yellow 5GN conc.	42
Yellow R conc.	26
Violet B conc.	9
Brilliant Blue GAW	52

These showed the remarkable similarity between the members of the Irgalan series compared with the other ranges.

Another new test (illustrated at Fig. 1) was proving of great interest. This graph had been prepared by plotting the percentage exhaustion against the square root of time. The curve shown was typical of that obtained with a 2 : 1 metal complex dye of the Irgalan type. It would be observed that for this type of colour, dyeing proceeded in two distinct stages.

(1) High initial surface absorption or strike.

(2) Constant rate of strike, which was represented by the linear part of the graph.

This second stage was represented by tangent alpha or V value (V = velocity). If this straight line was extended to go through the vertical axis, it would give an intercept value shown as "So." A large intercept value corresponded to a high initial strike of the dyestuff.

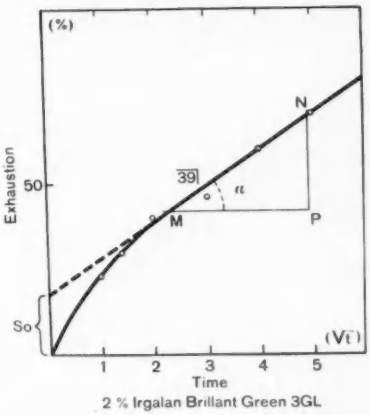


Fig. 1. Assessment of dyeing characteristics of wool

Dr. Hirsbrunner then showed several series of cheese dyeings which illustrated that, whereas the Irgalan type of dye strikes level and penetrates well from the first moment of dyeing, this was not the case with unmetallised dyes. This, he concluded, was the fundamental difference between the 2 : 1 metal complex dyes and dyes of other types. He went on to say that providing the circulation was adequate, the initial rate of strike (So value) was of virtually no importance with the Irgalans but that the rate of dyeing as represented by tangent alpha was the important factor. By assessing these two values for the 2 : 1 metal complex dyes at various temperatures, it was possible to predict the comparative level dyeing behaviour much better than on the results of the previous types of test.

Dr. Hirsbrunner then showed how these tests had provided the information from which the Irgalan high temperature dyeing method had been formulated. This was in principle very similar to the method put forward by F. L. Goodall for dyeing highly aggregated dyes, but it had been found to be much more successful in practice with the Irgalan range than with other groups of dyes, probably for the reasons already given. Only by using this type of dye, said Dr. Hirsbrunner, were we likely to get out of the dilemma of having to apply non-migrating dyes with the same satisfactory levelness in bulk practice as we had previously obtained with the level dyeing acid dyes.

SAW TOOTH WIRE FOR CARDS. British Standards House, 2 Park Street, London, W.1 (price 3s.).

This new British Standard (B.S. 2936: 1957) relates to taker-in wire for dealing with low, medium, and high grade cotton and cotton waste, It specifies certain basic dimensions of the cross-section of saw tooth wire. Details of the contour and form of the teeth are omitted, because of the continued experimental work and research now in progress on various types of cotton and mixtures of cotton with other fibres. The standard contains a diagram which facilitates interpretation of the dimensional table.

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The Technique of Dyeing Acrilan Fibre

IN the early days of the technical appraisal of "Acrilan" in the dyeing industry, attention was concentrated upon the dyeing properties of acid, pre-metallised and chrome dyes, and emphasis was given to the "wool dyeing" behaviour of the fibre. During the last twelve months, considerable quantities of "Acrilan" had been processed by the textile industry in Britain and this had enabled the dyeing techniques initially formulated in the laboratory to be reviewed in the light of practical experience, said Mr. H. R. Hadfield, M.Sc. (I.C.I. Ltd., Dyestuffs Division) in a recent paper to the West Riding Section of the Society of Dyers and Colourists on dyeing "Acrilan" acrylic fibre.

Discussing acid dyes first, Mr. Hadfield said that these were found very difficult to apply to yarn and piece goods and the high quantities of acid required usually caused a detrimental effect upon the desirable handle of "Acrilan." Nevertheless in spite of difficulties, acid dyes were used, with satisfaction, for certain purposes. For acid levelling pre-metallised dyes, high concentrations of sulphuric acid in the dyebath were required and the levelling properties were low. The absence of a fast to light blue dye for use in pale and medium depth shades resulted in a serious limitation.

Neutral dyeing pre-metallised dyes, when applied to "Acrilan" did not reproduce their desirable behaviour realised on wool but, nevertheless, for the production of pale, fast shades on loose fibre or slubbing, were of considerable value. Mordant dyes were not of any value for dyeing yarn or piece goods but in very heavy depth shades selected chrome mordant dyes could be used to dye loose fibre or slubbing with excellent fastness.

With the exception of fast turquoise shades based on Procion Brilliant Blue H7G, the present range of Procion or Procion H. type dyes was not generally of value for dyeing "Acrilan"; the use of basic dyes was limited to those cases where, from shade considerations, no alternative was possible.

Regarding the behaviour of disperse dyes applied to "Acrilan," Mr. Hadfield observed that the preliminary results suggested a fuller examination than had yet been described. Following a measurement of the saturation values of a series of disperse dyes and a comparison of the same dyes applied to "Orlon" and to acetate rayon, it was found that both the acrylic fibres possessed a lower saturation value with disperse dyes compared with acetate rayon and that, with the exception of Duranol Blue G. "Acrilan" possessed a higher saturation with the disperse dyes examined than did "Orlon."

In spite of the superior building-up properties of "Acrilan" compared with "Orlon," difficulty was still experienced with homogeneous disperse dyes when attempting to produce heavy shades. It was known, however, that on acetate rayon and "Terylene" mixtures of dyes built-up independently. Obviously this principle should be applied to "Acrilan."

It could be illustrated clearly that of dyes selected for experimental work, they did, in fact, build-up independently of each other on "Acrilan." It was to be emphasised that the practical dyer would be wise to adopt this principle for producing heavy depth shades as, not only was there an economical advantage, but there was less danger of dye being deposited on the fibre surface as a result of "over-saturation." Another very important property of disperse dyes was their ability to level. This property was of the greatest importance when dyeing piece goods and yarns, and it was also important in package dyeing acrylic fibres, as in hot dye liquors acrylic fibre packages became very compact, resulting in a low flow of dye-liquor and thereby a frequent initial uneven absorption of dye. Results obtained showed that good levelling was obtained with disperse dyes but that the effect was very dependent upon the temperature and that this was particularly the case with the moderate or slow diffusing dyes, but was not so marked with the rapid diffusing dyes. In spite of the good levelling properties of disperse dyes on "Acrilan" at 95–100°C. these dyes possessed a very good fastness to wet treatments at 60°C. or less.

The effect of high temperature dyeing of "Acrilan" had been investigated and the behaviour of disperse dyes above 100°C. These results showed that increased exhaustion was obtained, when dyeing for 90 mins., as the temperature was increased to 120°C. "Orlon" showed a temperature of maximum exhaustion at approximately 110°C.

In selecting disperse dyes for dyeing "Acrilan" besides the usual properties considered such as light fastness, wet fastness shade and dyeing properties, the fastness to heat treatments was most important property for many requirements, as "Acrilan" could be given durable pleating treatments by steaming. For this purpose a 10 minute treatment between atmospheric pressure and 5 lb. steam pressure was used. A sufficiently large range of dyes was available fast to heat and other treatments, to enable, for example, disperse dyes to be used to dye all but heavy depth shades even on loose fibre and slubbing where the highest standards were essential.

Discussing the three main methods of producing blacks on "Acrilan," these suggested were:—

(1) Use of chrome dyes. Good fast blacks could be produced but difficulties in obtaining reproducible results were obtained and, in addition, the handle of the fibre was seriously affected.

(2) Use of Ultralan Black RN. Good blacks of moderate fastness were produced, but as large concentrations of sulphuric acid in the dyebath were essential, the handle of the fibre was seriously affected.

(3) Use of Duranol Black 2BN. Good blacks of moderate fastness were produced, the fastness was not sufficiently high for clubbing or loose fibre dyers; and large amounts of colour were essential. Economic factors were, therefore, of primary importance.

The speaker suggested that the use of azoic dyes dispersed Diazo Black B. with Brenthol OT. or Brenthol FR. for the production of blacks offered a marked advantage for most purposes, over the alternatives listed.

Discussing dyeing techniques, good results on 100% "Acrilan" had been obtained by (*a*) dyeing piece goods with disperse dyes on a winch or on a paddle machine (*b*) yarn dyeing with disperse dyes on a two-stick Hussong type machine (*c*) slubbing dyeing either as tops in a central spindle holder or as packed hanks in a cage or can holder using a package dyeing machine equipped with a circulating pump. It appeared, therefore, that provided the right type of machinery was available, 100% "Acrilan" could be dyed in a wide variety of yarns with entirely adequate standards of fastness. It was wrong, however, to regard "Acrilan" as a fibre which, from the dyeing view point, behaved as did wool, and, ultimately, less difficulty was caused if it was recognised that "Acrilan" was a new synthetic fibre, which must be considered in its own right as a dyeing problem. Generally, disperse dyes were the most attractive, although for specialised purposes, azoic, acid basic, chrome, pre-metallised and reactive dyes would be found of value.

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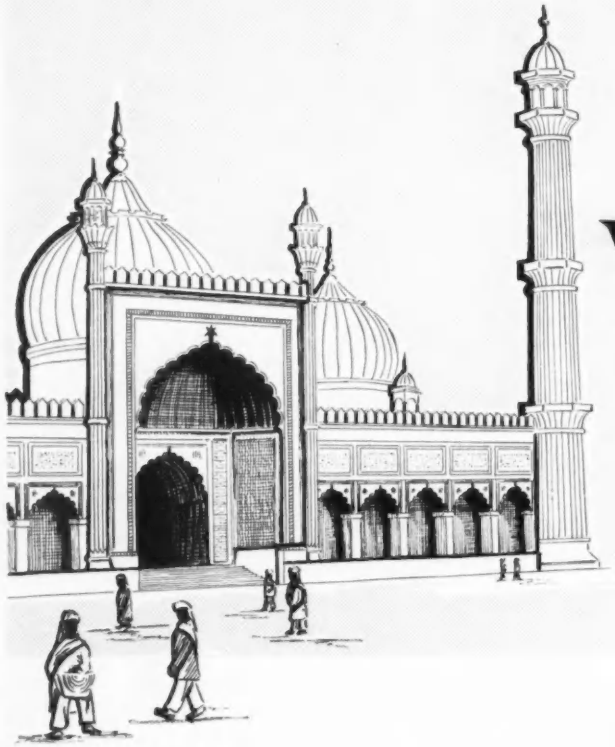

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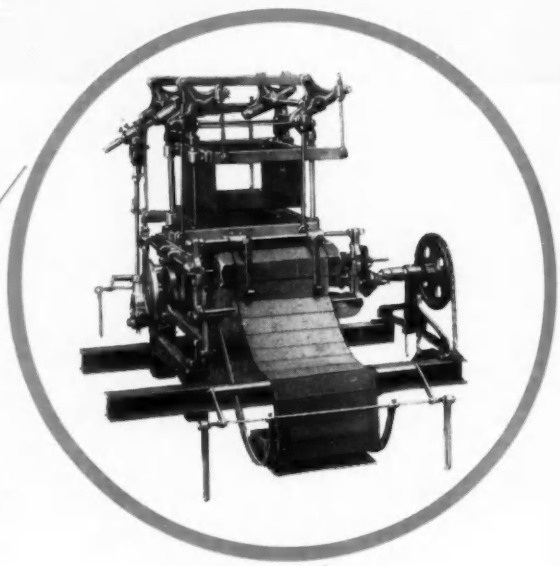

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Dyeing and Finishing Developments in the Carpet Trade*

By R. C. CHEETHAM†

THE use of fibre blends for textile purposes is extending to the carpet trade, requiring in many cases novel techniques in dyeing and finishing. The variety and complexity of some of these experimental blends often means individual treatment and the dyer is thus being called upon to extend his knowledge of dyes and dyeing methods in endeavours to produce the required fastness standards.

In yarn dyeing the first criterion is levelness of shade and in this connection most dyehouses are equipped with the conventional Hussong machines. These machines may have served the purpose very well for wool but are not ideally constructed for many man-made fibre blends particularly those containing cellulosic fibres. Experience has shown that whilst acceptable standards of levelness may be produced on yarns intended for certain designs it is difficult to ensure satisfactory levelness on cellulosic blends for plains or heavy ground shades. It would seem that the solution of this problem may involve consideration of engineering as well as technology. The Hussong machine may therefore be re-designed to accommodate cellulosic fibres, taking into account the rate of strike and migration of direct dyes.

In the meantime experiments have been carried out in the package dyeing of "Fibro" blend carpet yarns on a horizontal arm machine but apart from the difficulty of winding suitable packages of economic size it was found the degree of levelness was still not as high as would be expected from levelling acid dyes on wool. There is the additional difficulty of scouring woollen spun yarns in package form.

There has been considerable activity over the last year or so in experimental scouring and oiling techniques for carpet yarns. Traditionally the processing of wool carpet yarns has been based on oleine and the soap/soda ash scour. Many man-made fibre blends spin satisfactorily without the use of oleine and in any case scour more easily than wool so do not require strongly alkaline scour liquors.

Consequently developments have been on the lines of using easily removable oils based on mineral oil with synthetic detergent and then scouring liquors consisting of synthetic detergent and weak alkalis such as sodium bicarbonate. A further development has had as its object the elimination of scouring by spinning with an auxiliary agent of the Cirrasol A.R. type. It was also hoped that by this method increased resistance to soiling could simultaneously be conferred on a viscose blend.

In practice we have found that Cirrasol spun yarns, unless the complete absence of oil contamination can be ensured, still require scouring and further, the degree of soil resistance is purely marginal even under the most favourable conditions. Incidentally it has been demonstrated that an all-viscose carpet yarn suitably oiled and efficiently scoured has a soiling rate which is no greater than a carpet oiled and scoured by conventional methods.

Dyeing is carried out on either staple, yarn or piece although the latter is confined almost entirely to tufted carpets. The dyeing of staple is most satisfactory from the point of view of levelness when carried out in machines such as the Obermaier with a positive liquor flow from inside to outside of the pack. The pear-shaped Longclose and other similar machines can, however, be used for coarse deniers and have the further advantage that larger weights can be handled than in the Obermaier type.

Best results for staple are obtained by dyeing individual fibres rather than blends since the dyeing method can then be more closely correlated with the intrinsic properties of the fibre. "Fibro" (Courtaulds' viscose staple) can generally be dyed to satisfactory fastness with direct dyes although in certain cases sulphur dyes are possible and where price permits vat dyes may be used. Wet fastness is the chief problem in darker shades with direct dyes and after treatments are usually necessary. In this connection increasing use is being made of Duracol fibres (Courtaulds' spun-dyed fibres). "Fibrolane" can be dyed with pre-metallised and aggregated acid dyes. "Tricel C" and "Fibroceta" are dyed in staple form with disperse dyes whilst for "Courtelle" (Courtaulds' acrylic fibre) the modified basic dyes can be applied. Recently a number of shades including scarlet have been dyed successfully on 15 den. "Courtelle" in commercial weights with Sevron dyes using a pear-shaped Longclose machine.

Levelness in yarn dyeing is more critical than for staple and in practice far more attention has to be given to the factors influencing levelness such as rate of strike and dye migration. Blends containing cellulosic fibres are usually dyed mainly with direct dyes, using Class B for the medium and darker shades but making maximum use of Class A dyes both for body colour in pale shades and for salting-on in all cases. Temperature control is most important and it is advantageous to add a proportion of the salt at start avoiding large additions in course of dyeing. Additions in any case should preferably be by controlled means, e.g. by drip feed equipments. Similar principles are followed for the piece-dyeing of carpets with pile which contains viscose rayon.

The large weights of fibre called for in the carpet trade has stimulated research on continuous dyeing methods. In this connection joint research efforts are proceeding between Courtaulds Ltd. and I.C.I. Ltd. on the dyeing of viscose staple and other forms of material with particular reference to the application of the Procion dyes.

The use of these dyes for loose "Fibro" has been demonstrated on a raw wool scouring machine but for various reasons, mainly connected with length of liquor and squeezing of the fibre, it would seem necessary to design a machine adapted to the process and fibre. Trials on "Fibro" and "Fibrolane" are proceeding on the Fleissner perforated rotating drum with Procion dyes as well as with conventional direct and aggregated acid dyes respectively. A considerable amount of work has been done on a continuous method for tufted carpets of 100% viscose pile with direct dyes. Selection of dyes has been shown to be critical and it seems evident certain special features apply to piece goods such as expression of dye-liquor and conditions of fixation.

It has been observed that carpets made from viscose rayon sometimes require changes in sizing technique due to wicking of the size and consequent stiffening of the pile. These difficulties can be overcome either by increasing the viscosity of the sizing medium or by the addition of an agent to alter surface tension. It has been shown that for an Axminster made from 50/50 "Fibro"/"Fibrolane" yarn can be sized successfully with a high viscosity Courlose/polyvinyl acetate size or alternatively the yarn can be pre-treated with a dilute solution of Alcamine followed by the application of the standard size used on all wool carpets.

Experimental work has been done on the possibility of including in a wool blend sufficient "Fibrolane," which has been treated with a moth resisting agent, to confer a substantial degree of general resistance on the blend. It seems likely that about 30% of "Fibrolane" treated with Dieldrin could be incorporated into a woollen carpet blend containing wool with a measure of success as regards moth resistance.

SWITCHGEAR, ETC. The following have been published by Lancashire Dynamo Nevelin Ltd., Oxted, Surrey: List LS.1800. This introduces a range of standard alternator control switchboards and feeder panels for ratings up to 2,000 amps. at 550 volts. List LS.40. A comprehensive leaflet dealing with the wide range of standard and "purpose design" heavy industrial switchboards and "Unifront" flush fronted switchboards for low tension distribution applications. List NML.12. A leaflet describing "Varionic" variable speed drive to provide a range of speed for outputs up to 1,000 h.p.

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* *From a paper given at the one day conference held recently at the British Rayon Research Association.*

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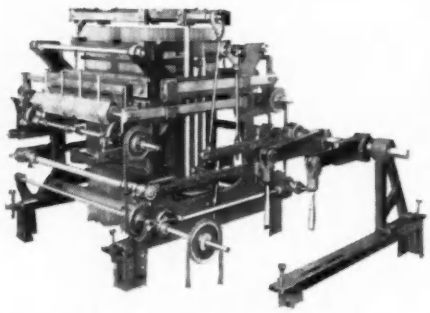

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Book Reviews

INTRODUCTION TO OPERATIONS RESEARCH. C. W. Churchman, R. L. Ackoff and E. L. Arnoff. Chapman and Hall Ltd., 37 Essex Street, London, W.C.2 (price 96s.).

The application of Operations Research, briefly defined as "quantitative common-sense," to industrial production and marketing-research problems has long passed the inchoate stage and this use of the scientist's training and methods in the solution of non-scientific, executive-type problems has resulted in a rapid increase in the number of practitioners since its introduction, in its military context, during World War II. The present world-wide interest is shown by the fact that the first international conference on the subject was recently held in Oxford.

The authors of this volume of some 650 pages are members of the Engineering Administration staff of the Case Institute of Technology, Cleveland, Ohio, and the text has grown from lecture material used there. Their book provides prospective consumers of O.R. with an introduction to its characteristics, procedures and scope and offers potential practitioners a survey of the field and a basis for more advanced study. Varying degrees of mathematical ability are required for intelligent appreciation of the cases studied. The text is divided into ten fully documented parts, the first three and the last one of which are addressed principally to those who wish to make use of O.R. Part One is concerned with the meaning of O.R.; Part Two with the formulation of problems and the weighting of objectives; and Parts Three to Nine deal in detail with the conceptual models employed, beginning with inventory control and ending with the testing, control and implementation of the models, procedures and solutions. In Part Ten, the important administrative problems involved in the selection, training and organisation of O.R. teams are discussed. The treatment throughout is admirably simplified and suitable to the variety of readers with diversified interests for whom it is intended.

C.L.W.

* * *

SYNTHETIC DETERGENTS. By F. A. R. Puplett, M.A.(Cantab.). Sidgwick and Jackson Ltd., Tavistock Chambers, London, W.C.1. 1957, 241 pages (price 42s.).

This book describes the development and marketing of synthetic detergents. While, before 1939, usage of the new detergents was only small and mainly for industrial and cosmetic preparations, the development of the newer materials began during and after the war and after soap rationing and by 1954 approximately 40% of all detergent materials used both domestically and industrially in the U.K. was based on the new synthetic detergents. The first chapter describes the origin of soap and the development of the soap industry; the author explains the well-known limitations of soap, its poor resistance in hard water and its unsuitability in industrial processes which are sometimes carried out in an acid solution. This is followed by a brief description of the origin of synthetic detergents and the subsequent development of the synthetic detergents to a production figure of about 253,000 tons in 1955.

In the next chapter the author explains the general structure of the detergent industry being divided into the manufacturers of the raw materials, the converters and the distributors, the latter being principally the soap companies. When studying the table on the estimated relative importance of various types of synthetic detergents it is interesting to note that while in 1948 primary and secondary alkyl sulphates accounted for 70% of the production, in 1953 they decreased to 17% while alkyl/aryl sulphonates, which were practically unknown in 1948, increased their share in the production to 76% in 1953. Other sections of the book deal with the household market—its competitive structure — and with the use of synthetic detergents in the industrial processing and industrial cleaning market. Table 23 shows that in 1955 about 81% of synthetic detergent sales were absorbed by the household market, and 19% by the industrial market.

The author discusses the development of synthetic detergents, the general structure of the industry, the household market and its competitive structure, the industrial processing market and the general industrial cleaning market; also the function of advertising and the influence of advertising on brand and total demand of synthetic detergents in the household market. One cannot entirely agree with the conclusion that synthetic detergents on performance alone would not have reached such great sales figure without advertising and sales promotion. We can, however, congratulate the author for writing such an excellent and interesting book. Many of the statistical tables are published for the first time and many of the twenty-eight tables are self-explanatory and enhance the value of the book. There is also a comprehensive bibliography at the end.

B.S.

* * *

MANAGEMENT NOTEBOOK. By Dr. A. Roberts (edited). Published by Newman Neame Ltd., 50 Fitzroy Street, London, W.1. 1957. Pp. 237 (price 35s.).

This volume deals in detail with the subjects comprising the syllabus of the Intermediate Certificate in Management Studies. It is the result of many years of practical teaching experience and Dr. Roberts, formerly Reader in the Department of Industrial Administration at Manchester University, and his team of collaborators have been very successful in presenting the subjects. These and their sub-headings correspond exactly to the official syllabus. They comprise the evolution of modern industrial organisation, the nature of management, the economic, legal and psychological aspects of industry and commerce, financial and cost accountancy, statistical methods, office organisation, work measurement and incentives.

The book is produced for students of management and for management trainees, also for teachers and education and training officers. It is printed as a note-book-cum-textbook with blank pages and half pages to enable the student to make notes throughout the period of his study course. In his foreword Mr. L. Urwick, chairman of the Committee on Education for Management, says correctly "every man is much more what he has made of his educational opportunities than what any educational process has made of him."

B.S.

* * *

JOURNAL OF THE BRADFORD TEXTILE SOCIETY 1956-57. Published by Donald Flather, Bradford. 1957. Pp. 149 (price 10s.).

This yearly publication gives a record of the activities of Bradford Textile Society, a very stimulating and inspiring Society which was able to attract so many well known and expert speakers during the recent session. Among them Mr. J. R. Whinfield with a paper on "The New Fibres—Evolution or Revolution," Mr. A. W. Davidson who lectures on the "Shrinkage of Wool Goods," and Mr. H. K. P. Wood of the International Wool Secretariat on "Wool Promotion." But apart from the report of these lectures and discussions, there is a record of the annual meeting with speeches of Lord Tweedsmuir and Mr. W. W. Early, the President of the Society, and other interesting articles on wool and textiles. The journal is extremely well produced and includes also a selection of excellent illustrations of paintings and photographs. Offered at such a reasonable price it will undoubtedly give great pleasure to the members and friends of Bradford Textile Society.

B.S.

* * *

TRAINING DESIGNERS FOR INDUSTRY. Federation of British Industries, 21 Tothill Street, London, S.W.1 (price 3s. 6d.).

Many interesting suggestions concerning the education and training of designers for the furniture, pottery, printing and textile industries are contained in this report of a one-day conference between industrialists and educationalists, organised under the auspices of the F.B.I. and held in London on September 24, 1957. The booklet includes introductory remarks by Sir Norman Kipping, F.B.I. Director-General, the opening address by Sir Edward Boyle, Bt., M.P., Parliamentary Secretary, Ministry of Education, and reports by the chairmen of the five discussion groups on important points made in the course of the day's conference, together with a summing-up by Sir Ernest Goodale, Chairman of the F.B.I. Industrial Art Committee.

* * *

CARPET ANNUAL, 1957–58. British-Continental Trade Press Ltd., 222 Strand, London, W.C.2 (price 20s.).

An outstanding section of the latest edition of this widely-used reference book is the 40-page pictorial record of the best current designs produced by the world's carpet industries. Among the special articles is a survey of technical developments in carpet manufacture contributed by H. A. Reinhardt, a technical expert of Bigelow Sanford Carpet Co. The first two chapters of the Annual review the world carpet industry and contain the latest available trade statistics. Special attention is paid to the oriental carpet trade. The bulk of the volume is given over to a classified directory

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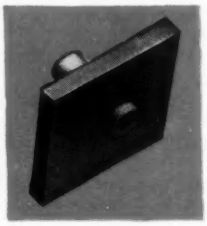

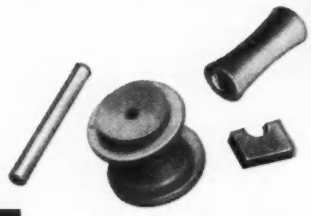

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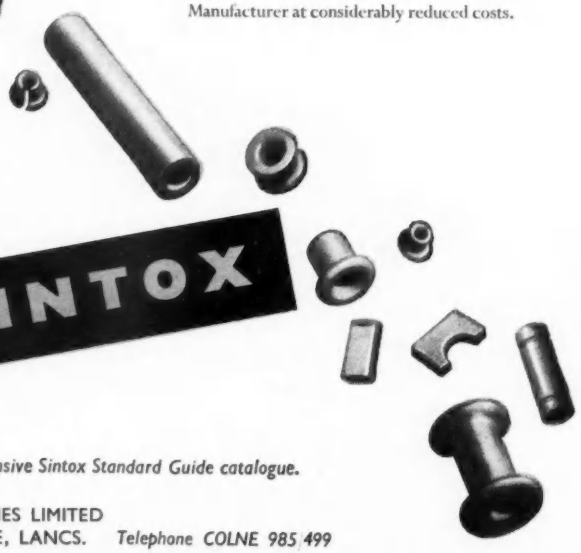

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C.L.W.

* * *

SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1957–58. Thomas Skinner and Co. (Publishers) Ltd., 44 Brazennose Street, Manchester 2 (price 60s.).

The arrangement of contents in the new edition of this perennially useful directory has been subjected to major changes, so that the material presented now falls largely into two parts. British firms are listed in order of processes from brokerage and handling of the raw materials to the finished product. Overseas firms are arranged by nationality with appropriate trade classifications for each country. Particularly valuable innovations are the separate sections for British and overseas tufted carpet manufacturers and the list of "Sanforized" licencees which follows the "dyers and finishers" section. The "classified fabrics" section and the lists of British and U.S. trade names are additional guides to sources of supply. The omission of the "directors and partners" section, which has for so long been a feature of "Skinner's" is to be regretted. Other information provided includes a classified directory of mill supplies, details of textile industry organisations and numerous statistical tables.

C.L.W.

* * *

SKEIN-WINDING REELS: STUDIES IN WORD HISTORY AND ETYMOLOGY. By C. H. Livingston. University of Michigan Press, Ann Arbor (price 45s.)

The winding of yarns into skeins goes back to antiquity. The universal use of the skein-winding reel before the introduction of modern mechanical methods led to the growth of many picturesque and figurative expressions in many European languages, dialects and patois. Professor Livingston has thus been given ample material for his research into the origin and evolution of these homely words and his work is timely in view of their probable disappearance because of the encroachment of the industrial processes of spinning and skein-preparation upon the primitive hand methods. His investigations have principally been confined to Northern France, the British Isles and the United States. A number of plates and figures add interest to the text and illustrate the variety of instruments formerly used in this domestic industry. Full bibliographical references are provided.

S.P.S.

* * *

SAFETY COLOURS FOR USE IN INDUSTRY—B.S. 2929 : 1957. British Standards Institution, 2 Park Street, London, W.1 (price 4s. 6d.).

This British Standard specifies the meaning and application of a limited number of colours to be used for the purposes of preventing accidents and of meeting certain emergencies which may arise in industry. The three safety colours are No. 537 (signal red) of B.S. 381C; No. 356 (golden yellow) of B.S. 381C; and green, No. 0–010 of B.S. 2660. Examples of the uses are given.

* * *

FIBRE MICROSCOPY. J. L. Stoves, M.Sc., Ph.D., F.R.I.C., F.R.M.S. National Trade Press Ltd., Ingersoll House, 9 Kingsway, London, W.C.2 (price 50s.).

At no time in the long history of the textile industry has the need been greater than at present for students and research workers to have access to the best possible literature in the form of articles, monographs and text-books covering every aspect of textile technical education and written by people thoroughly acquainted with every detail of their particular specialised subjects. Unfortunately, there are still many really serious gaps in textile literature and the urgency for steps to be taken to remedy these shortcomings cannot be too strongly emphasised. The problems are not easy in view of the comparatively limited sales of books of this nature coupled to the extremely high production costs. However, in writing this book Dr. Stoves has not only succeeded admirably in compiling a fine reference work of inestimable value but it has also been completed and kept within very reasonable dimensions (280 pages) at a cost which is not prohibitive even to students. The author describes the most efficient use of the compound microscope, methods of preparing fibres for examination, a broad outline of more advanced techniques and examples of technical applications of fibre microscopy. Divided into two sections the first part of the book is concerned with principles of microscopy. It covers the compound microscope, illumination, the polarizing microscope, phase contrast and interference microscopy, photomicrography, ultra-violet microscopy, reflecting microscopes and spectromicrography, the electron microscope and metal shadow casting in visible microscopy. Part 2 covers the microscopy of fibrous materials and deals with preparation of specimens, animal, vegetable, man-made and mineral fibres and microscopic methods of identification. Special reagents and stains are listed in an appendix. Extensively illustrated and displayed there is little one can criticise in such a distinctive work and it will, undoubtedly, serve for many years as a classic for the guidance of all concerned with this tremendously important subject.

J.D.

* * *

COUNTRY INDUSTRIES. Rural Industries Bureau, 35 Camp Road, Wimbledon Common, London, S.W.19 (price 1s. 6d.).

The work of the Rural Industries Bureau is to provide technical advice, assistance and training to country workshops. This annual report for 1956-57 reveals how the Trustees of the Bureau have faced up to the changes in village life and have made proposals to develop the Bureau's services so as to help the export drive and increase home food production. A survey of small firms has been undertaken and efforts have been redoubled to adapt new materials and techniques to rural industries. The Welsh woollen industry has been given help in the design, costing and marketing of its products and in producing lightweight and lighter-coloured tweeds suited to the dollar market. The report gives full details of the Bureau's officials, offices and publications.

* * *

DESCRIBING MAN-MADE FIBRE FABRICS.—British Standards Institution, 2 Park Street, London, W.1 (price 2s. 6d.).

This new British Standard (B.S. 2935) recommends a uniform method of describing man-made fibre fabrics. Starting from the premise that man-made fibres are usually known either by their generic names, such as rayon or nylon, or trade marks like "Terylene" or "Tricel," the standard says that fabrics made from any one fibre should be described by naming that fibre by its generic name or trade mark, or by using both together. In dealing with fabrics which contain two or more fibres, the standard recommends that they should be named in order of dominance by weight, again using either the relevant generic names or the trade marks. Thus a fabric containing more rayon than nylon should be described as "rayon/nylon."

* * *

STANDARD FOR FLAT CARD DRIVING CHAINS. British Standards House, 2 Park Street, London, W.1 (price 3s.).

This new British Standard (B.S. 2934) issued as part of the programme of standards being developed by B.S.I.'s textile machinery industry standards committee, deals with chains for driving the flats on cards processing staple fibres. The standard specifies basic dimensions of the chains; the material for links and bushes, and a length test. The table of dimensions is "keyed" to a full page diagram of the chain.

* * *

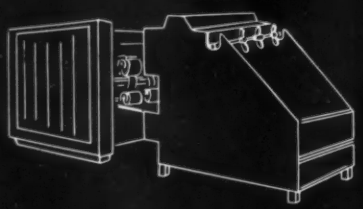
OPPORTUNITIES IN NYLON. Recently issued by British Nylon Spinners Ltd., two excellent publications concern (*a*) the work of the company and (*b*) the opportunities for scientists, technologists and engineers for careers within the organisation. Well written and profusely illustrated in both cases " Picking up the threads . . ." provides a brief description of the work of the 5,000 people now concerned with the production of British nylon yarns, together with an outline of the history and steady development of the company and its products. A regular training programme is established for all operatives and supervisory staff at all levels undergo comprehensive training including instruction in T.W.I. methods. This booklet also shows the processes involved in making nylon filament and staple. The second publication gives valuable information concerning the plants at Pontypool and Doncaster, housing and welfare services, salaries and prospects, the scope for scientific work, chemistry and physics research, plant technical work, research and development, and engineering.

* * *

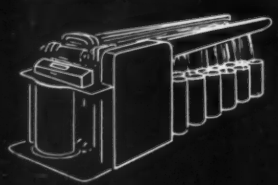
CONDITIONING HOUSE DIARY, 1958. City of Bradford Conditioning House, Canal Road, Bradford (price 6s.).

Maintaining its usual high standard for the valuable information included, the new diary sets out the rules of the Conditioning House, with moisture tests for tops, wools and noils, official regains and allowances (Bradford), standard regains and allowances (international), and yield test of greasy wool. Tests on yarn for moisture, count, strength and twist are included, also analysis and tests for strength of cloth. Trade agreements, yarn count systems and conversions, tables of mensuration, capacity and weight are additional features of this low-priced pocket reference work.

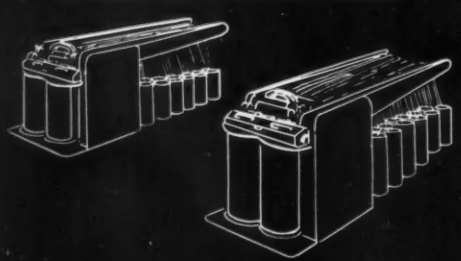
Mackie System for Low Cost PRODUCTION

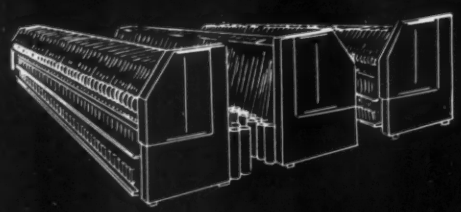


CARD & HOPPER FEED



INTERSECTING DRAWING FRAMES





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This system is suitable for Viscose, Acetate, High Crimped Nylon, etc., from 4·5 - 50 Deniers & 4·5" - 8" staple. Complete units of The Mackie system are already working in Europe and U.S.A.

TEXTILE MACHINISTS SINCE 1846

James Mackie & Sons Ltd

BELFAST, NORTHERN IRELAND

S1.

Technical Literature

"TERYLENE" NETS AND TWINES. A six page leaflet from I.C.I. Ltd., Millbank, London, S.W.1, gives brief details of some of the inherent properties present in this valuable synthetic fibre; these include low stretch, rotproof, high wet and twist strength, quick drying and not damaged by sunlight. In conclusion, the publication reviews the use of "Terylene" nets in gill, trawl and seine net fishing.

* * *

HISTORY OF FLAX. A booklet by the Flaxspinners and Manufacturers Association, 1 Royal Exchange, Dundee, outlines, with many illustrations, the development of the flax industry through the ages. Flax was used by the Egyptians for making twine and nets, the Phoenicians used it for sails, whilst the Romans made it into awnings as a protection from the sun's heat. Indeed it was the Roman armies who introduced the fibre to these Islands, establishing a manufacturing centre at Winchester. From these early beginnings the progress of flax is traced pictorially: the Bayeux Tapestry, Nelson's flagship, the "Victory—the sails of which were of flax—and so on, up to present day processing techniques.

* * *

CITY AND GUILDS BROADSHEET. City and Guilds of London Institute, Gresham College, Basinghall Street, London, E.C.2. The entries for the 1957 examinations were 127,426, compared with 112,988 last year (all trades). This increase is a noteworthy sign of the increased provision for technical education in the country generally, a tribute to the employer's policy in granting part-time day release and other facilities, an expression of the keenness of the young employee and an indication of the expanding work of the institute.

* * *

SOLDERING ALUMINIUM. Information Bulletin No. 23. Aluminium Development Association, 33 Grosvenor Street, London, W.1 (price 2s.). The bulletin gives definitions and a brief account of the basic principles of soldering aluminium, including a note on the grades of pure aluminium and the alloys suitable for soldering techniques. Available forms of solders are described, and representative solders tabulated with an indication of their applications and methods of use. Suitable fluxes are grouped under those suitable for soft soldering, cable jointing—a very extensive use of aluminium soldering—and for hard soldering. The principal section of the book deals with soldering methods and equipment.

* * *

G.E.C. EXPORT GUIDE. Economic and Marketing Research Unit, General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2. The October issue of this valuable aid to exporters indicates continuing opportunities for British manufacturers to enter foreign markets. The most up-to-date information available on the export prospects for 36 major groups of British products in 34 countries will be found in the guide, together with an indication of the economic conditions in these countries.

* * *

NYLON NETS. British Nylon Spinners Ltd., 25 Upper Brook Street, London, W.1. The increasingly important part being played by nylon in the fishing industry is described in a new sixteen-page booklet, "British Nylon for Fishing Nets." This explains why nylon is so suitable for these various types of netting and contains much useful information about a wide variety of subjects from net stability and knot strength to moisture uptake, shock strength and resistance to chemical attack.

* * *

DU PONT MAGAZINE. Three articles of textile interest appear in a recent edition of this magazine. The first: "Textile Tough Guy" gives brief details and uses for "Teflon," the new fluocarbon fibre. The remaining two: "Finishing School for Fibres" and "Seven Million Feet" deal briefly with synthetic fibres in relation to the Du Pont research laboratory and nylon pile carpet respectively.

* * *

ALUMINIUM COURIER. Aluminium Development Association, 33 Grosvenor Street, London, W.1. Aluminium curtain walling can permit an infinite variety of construction and be suitable for a wide range of buildings. This particularly attractive wall medium is admirably surveyed in a recent edition of this famous development publication. Fifteen half-tone illustrations are included showing various applications of aluminium curtain walling.

* * *

SOLENOID VALVES: GAS. The solenoid-operated valves described in a data sheet from Black Automatic Controls Ltd., Leafield, Corsham, Wilts., have been developed primarily for the automatic control of gas burning installations and appliances. Some of the features are: suitability for use with town gas, methane, propane, butane, nitrogen, compressed air, etc., all valves open when energised and close when the solenoid is de-energised or conversely unless stated otherwise.

* * *

"EVERGLAZE" FABRICS. A well produced brochure from "Everglaze" Marketing Division, 134 Wigmore Street, London, W.1, contains—on the centre pages—representative swatches illustrating 24 examples of "Everglaze" finishes. This excellent illustrative method immediately provides the reader with important fabric features such as handle, weave, etc., obviating completely the need for lengthy explanation.

* * *

GEON 121 PASTE RESIN. A 19-page technical bulletin published by British Geon Ltd., Devonshire House, Piccadilly, London, W.1, commences with a chapter on compounding, plasticization, stabilization, etc., and proceeds to describe the processing of this P.V.C. Resin. This particular section is in two parts, the first dealing with the mixing, deaeration and storage of the pastes, the second covering briefly the coating of fabrics and paper. The text is copiously supported with tables and graphs.

* * *

TERMAZYM AND AQUAZYM DESIZING. Novo Industrie A/S, Copenhagen, have released an excellent brochure introducing Termazym in powder form, and Aquazym a liquid. Both are manufactured on a basis of bacterial enzymes and are claimed to have the same desizing effect. General desizing rules for use with these two mediums are included, together with chapters on special sizes and specimen recipes.

* * *

DURABLE SOFTENING AGENT. Pamphlet No. 48 (auxiliary products) available from I.C.I. Ltd., Dyestuffs Division, Hexagon House, Blackley, Manchester, is concerned with Velan PF. Well known as a product producing water-repellant finishes, its use as a softening agent is frequently overlooked, and at low concentrations, applied by impregnation or by exhaustion, followed by drying in the normal way, it is a powerful softening agent producing attractive effects on many types of fibres. The booklet outlines the general properties of Velan PF, followed by the methods of application on cotton or linen, viscose and cuprammonium rayon, silk and poly-acronitrile fibres.

* * *

TEXTILE NECESSITIES. A wealth of technical information is included with the descriptive details in a very useful publication by George Angus and Co. Ltd., Olympic Buildings, Thornton Road, Bradford, which features some of the company's wide range of textile specialities. Illustrations of the different types of surfaces available in condenser rubbers and tapes are accompanied by measuring instructions when ordering, also for combing and gill box leathers. Citing the advantages of Gacots and the applications—sliver lap and ribbon lap machines, combers, drawframes and fly-frames, ring frames and mules—the booklet gives information on dimensions and colour, ordering, mounting and grinding. Eighteen different types of buffalo hide pickers are illustrated, also five types of synthetic underpick pickers. Picking bands, loom leathers, buffers, swell and brake linings, temple roller covers, belting, V-ropes, fire hose and fire extinguishers are also admirably dealt with and illustrated in this excellent catalogue.

* * *

TECHNICAL CHEMICALS.—Howards of Ilford Ltd., Ilford, Essex. This booklet, a reprint of one published in 1954, contains up-to-date information on more than 40 technical chemicals produced for the textile, plastics, leather, soap and cosmetic, adhesives and allied trades (a separate publication, "Technical Chemicals for the Paint Trade," was issued in 1955 for the paint trade). Copies are available on request.

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Export Opportunities

Bahamas:
Lace Tablecloths

Mr. K. Mackintosh, P.O. Box 1646, Nassau, Bahamas, wants to represent a U.K. manufacturer of medium to very high quality cotton lace tablecloths in sizes 54×70 ins. up to 72×126 ins., coloured white, cream and beige. He is a commission agent handling textiles and clothing for the tourist trade. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, Barclays Bank Building (P.O. Box 393), Kingston.

U.S. Forces Post Exchanges

The John K. Kealy Co., 2294 San Pablo Avenue, Berkeley, California, are interested in U.K. consumer goods for sale to U.S. army, navy and air force post exchanges in the U.S.A. and other countries. The firm are interested only in items which carry well-known trade names. For post exchanges overseas they suggest as possibilities, knitted outerwear, men's socks, linen and other textile piece goods, tweeds for sports jackets and worsted flannels, etc. in cut lengths. The company operate as commission agents and at present sell to approximately 170 post exchanges in the U.S. and 80 to 85 overseas. Orders for overseas post exchanges would be forwarded to the manufacturers by them or in some instances, in the case of repeat orders, by the post exchange officials. Goods would be shipped direct to the post exchange and payment would be made by the U.S. government to the U.K. firm. On domestic business, if the U.K. firm did not maintain stocks in the U.S., the Kealy Co. would import for their own account for resale to post exchanges. Manufacturers interested should send offers by air mail direct to the John K. Kealy Co.

U.S.A.:
Manila Rope

Mr. J. E. Thumlert, P.O. Box 405, Baltimore 3, Maryland, wants to contact U.K. manufacturers of manila rope not already represented in the U.S.A. He has been a manufacturers' agent for more than 30 years, selling principally cordage products, also canvas and duck. Manufacturers interested should write direct giving quotations showing both f.o.b. and c.i.f. prices in U.S. dollars, also copy their correspondence to the British Consulate, Suites 611 and 612, Keyser Building, Calvert and Redwood Streets, Baltimore 2.

Ceylon:
Furnishing Fabrics, etc.

The firm of J. L. Carwallio, 144 Main Street, Colombo 11, would like to represent U.K. manufacturers of the following:—

(1) Cretonne furnishing fabrics, 48 ins. wide.
(2) Printed cotton bedspreads.
(3) Damask table napkins.

They are old-established manufacturers' representatives and firms interested should write direct, also notify the U.K. Trade Commissioner, 2nd Floor, Hongkong Bank Building, P.O. Box 745, Colombo.

Canada:
Woollen and Worsted Yarns

Mr. C. Nichols, 6355 Park Avenue, Montreal, P.Q., would like to represent a U.K. woollen and worsted yarn manufacturer specialising in natural undyed yarns. He already represents one U.K. firm of worsted yarn manufacturers in Quebec and Ontario, and has been a yarn agent since 1948. Manufacturers interested should write direct, also inform the U.K. Trade Commissioner, 1111 Beaver Hall Hill, Montreal.

U.S.A.:
Rope and Fittings, etc.

North-West Wire Rope Co., 966-77th Avenue, Oakland, California, want to contact U.K. manufacturers of wire and manila ropes, shackles, turnbuckles, clips, etc., wood and steel blocks, open link and stud link anchor chain. The firm would import for their own account and sell to jobbers throughout California, Washington, Oregon, Alaska and Hawaii. Manufacturers interested should write direct giving quotations which show f.o.b. and c.i.f. prices in U.S. currency, also copy correspondence to the British Consulate-General, 2516 Pacific Avenue, San Francisco 15.

Switzerland:
Tweeds

Mr. K. W. Schwarz, St. Peterstrasse 1, Zurich, would like to represent manufacturers of Scottish tweeds for suits and sports jackets. Established in 1942, he covers the whole of Switzerland and his principal customers are clothing manufacturers. Mr. Schwarz who, until recently, held only representations of German and Italian woollen manufactures, has now acquired one or two U.K. agencies and is anxious to extend his connection. Manufacturers interested should write direct, also notify the British Consulate-General, Dufourstrasse 56, Zurich.

Cuba:
String

Mr. D. Crews, Lonja 535, Havana, is anxious to obtain a U.K. agency for cotton string (2 and 3 ply). He is a commission agent and manufacturers interested should write direct. Prices quoted should be in U.S. dollars either f.o.b. U.K. port or preferably c.i.f. Havana.

U.S.A.:
Shirting Material, etc.

J. H. Bonck Co. Inc., 1100 So. Jefferson Dr. Pkwy, New Orleans, La., are interested in receiving quotations from U.K. manufacturers for:—

(1) Fabric for men's sports shirts in cotton and cotton blend. Minimum width 35 to 36 ins. Quantity required —2,500 yds. minimum.
(2) Trouser fabric of cotton and cotton blend, preferable wash and wear. Minimum widths 35 to 36 ins. Colour—normal colour range.

The firm are manufacturers of sports shirts and trousers and the prices of material they are at present purchasing from domestic sources range from $1·00 to $1·50 per yd. Offers should be accompanied by sample swatches. Manufacturers interested should write direct giving quotations showing both f.o.b. and c.i.f. prices in U.S. dollars, also copy correspondence to the British Consulate-General, 403 International Trade Mart, New Orleans 12, Louisiana.

Western Germany:
Worsted Suitings

The firm of Wilhelm Probst, Wt. Elberfeld, Hofkamp 87, would like to represent U.K. manufacturers of worsted suitings. Established in 1897, they are an agency business for spinning/weaving mills and work on a commission basis. A distribution depot is maintained at their address. Their customers are clothing manufacturers, wholesalers, and department store concerns and central buying organisations. Manufacturers interested should write direct also notify the British Consulate-General, Cecilienallee 16, Dusseldorf.

Cuba:
Piece-Goods and Twine

Continental Import Company, Neptuno 607, altos, Havana, wish to represent U.K. manufacturers of men's suitings, nylon fishing twine, and nylon, rayon and cotton piece goods. The company has recently been established as commission agents and manufacturers interested, should write direct, also notify the British Embassy, Apartado 1069, Havana.

U.K. Mission for Canadian Tariff Board

A mission representing U.K. exporters of wool tops, wool yarns, wastes and rags is to appear before the Canadian Tariff Board at an enquiry, opening in Ottawa on February 10, into Canadian duties on these imports. Members of the mission are: Mr. A Sharp (vice president, British Wool Federation); Mr. J. B. Fox (president, Batley and Birstall Chamber of Commerce and past president of the Shoddy and Mungo Manufacturers' Association); Mr. J. R. B. Turner (representing the Worsted Spinners' Federation and the Association of Exporters of Raw Materials and Yarns; and Mr. D. G. Price (secretary, Export Group, National Wool Textile Executive.) They will present a case, drawn up by a panel of experts, under the chairmanship of Mr. M. Shelton (president, Worsted Spinners' Federation) on behalf of the Wool Textile Delegation and the Export Group, National Wool Textile Executive, supported by the Shoddy and Mungo Manufacturers' Association, the Association of Exporters of Raw Materials and Yarns, and the chambers of commerce of Batley and Birstall, Bradford, Dewsbury, Huddersfield and Ossett.

Change of Address

The Glasgow Office of Igranic Electric Co. Ltd., is now at 242 West George Street, Glasgow, C.2. (Tel. City 4537 and 4538).

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LONG LENGTH

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Whatever your air hose job, you can reduce your costs by using Goodyear Long Length Hose. It's your most economical buy—

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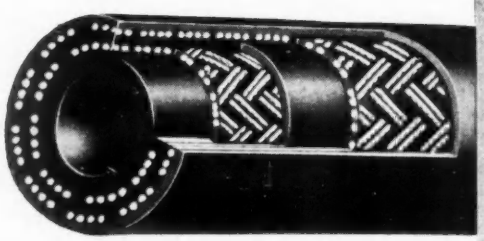
it can be cut to any length up to 500 ft., so eliminating hose wastage.

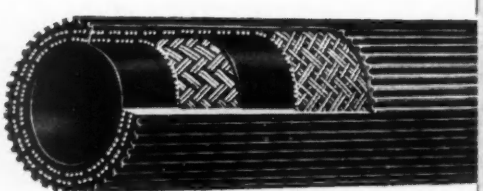
BECAUSE
it needs fewer couplings. Cuts not only the initial expense of couplings but also cost of maintaining them.

BECAUSE
it lasts longer. Goodyear Long Length Hose has a non-porous tube and abrasion-resistant cover built of high grade compounds for maximum wear.

Light in weight and of balanced construction, Goodyear Long Length Air Hose is easy to handle and resists kinking. There are two types of this hose—Style A and Style B, both available with smooth or corrugated covers.



STYLE A *for service where oil mist may be present in the line, and where operating pressures up to 325 lbs. per sq. in. are used.*



STYLE B *for general, light and medium pneumatic tool service and working pressures up to 210 lbs. per sq. in.*

Full details of both types can be obtained from Industrial Rubber Products Dept., Goodyear, Wolverhampton. We will also be pleased to advise on any air hose problem you have.

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Textile Trade and Prospects

Cotton Yarn and Cloth Markets

Statistics covering the Lancashire cotton industry during the four weeks ended November 30 showed that the total weekly average production of single yarn was 18·31 million lbs. compared with 17·61 million lbs. in the preceding four weeks. Cloth output was at the rate of 47·82 million yds., compared with 45·56 million yds., and the total number of people employed fell from 242,670 to 242,490. Actually there was a slight increase in those working in spinning but reductions in both the doubling and weaving sections.

At present, trading conditions leave much to be desired and activity in yarns and cloth is more or less limited to immediate requirements. Raw material values influence buyers considerably and, although, the situation regarding American staples shows little tendency towards excessive fluctuations the mere thought of the prospect is enough to make some buyers hesitate in the hopes that clearer indications may appear in the immediate future. Spinners report a considerable amount of inquiry covering almost every aspect of counts and qualities but the amount of firm booking falls a long way short of total capacity in general. In one or two instances, however, mill output has been limited by the shortages in labour and firms could handle more business but the emphasis is on early delivery. Medium counts and standard weaving qualities have been in fair request in ring beams, cheese, cone, and hank. Coarse yarns have had good, also condenser qualities in bleached and grey state.

Fine combed doubling wefts and hosiery numbers have been sold in modest volume. New business is extremely hard to find and new contracts difficult to negotiate. Order books are not in a very happy state, with little prospect of any immediate improvement. Speciality yarns and novelty folded types find ready support and considerable interest is maintained in blended qualities.

Business in cloth remains disappointing and has shown little uplift since the Christmas period. The amount of inquiry itself has only been moderate and overall sales far below what the trade regards as satisfactory. Apparel cloths have been the bulk of the available business with probably more interest shown in dobby and jacquard designs than in roller or screen printed examples. All cotton dress fabrics with excellent finishes have commanded attention and rayon blended cloths in new colours and effects have stimulated some buying activity. Furnishing fabrics are not being taken up as well as might be expected at this time of the year, and the blame here might, to some extent, lie with manufacturers. Looking round one sees little to arouse interest in merchants or wholesalers and it is now when these particularly should be ordering in volume. The disappointingly small number of new designs attract purchasers but there is far too much of a "sameness" about many of the styles being offered. Household cloths move reasonably well and quilts, pastel toned cotton and blended blankets are in fair demand. Towels—guest, hand and bath—have fallen off in recent weeks but an improvement is expected now after the Christmas and sales periods. New year sales now tend to be pointless affairs with so many of these being of blatantly "catch-penny" stunts that leave a nasty atmosphere and do untold harm to fair traders and the industry in general.

Export orders continue scarce with a few modest lines going through for Australia, some African and Continental markets. The government decision to restrict imports from China came as a surprise after the painfully long agitation concerning the much more important problems of increasing imports from India, Pakistan and Hongkong. The continued and uneasy silence over this question creates considerable anxiety and doubts in Lancashire trading circles. If the government has no intention of acting in this matter then the industry should be immediately informed and with the reasons.

Buyers Interest in Wool

After opening the second half of the marketing season on a quiet note, wool values have shown a firmer tendency in the past week or so and both in London and Commonwealth markets, prices of many types have moved fractionally against the buyer, according to an I.W.S. correspondent. Despite her reported intention to buy on a more modest scale this season, Japan is proving a leading influence in the Australian market. In the five months to the end of November, she retained her position as third largest buyer of Australian wool, giving pride of place only to the U.K. and France. Since the sales resumed a week ago, Japanese and Far Eastern buying has been a feature of the Australian market. The U.K., while buying on a somewhat smaller scale than last season because of credit restrictions, remains the largest buyer of Australian and New Zealand wool, and is second to France in the South African market. Recently, merino combing wools in Australia, though tested by heavy offerings, have tended to harden a little, especially in good style full-length wools which are less plentiful than usual on account of drought conditions during the growing season. Yorkshire has been buying more freely and there has been keen competition between U.K. and Far Eastern buyers. In New Zealand, too, prices have moved against the buyer. At Auckland clean costs of greasy crossbred combings were 1d. and sometimes fractionally more per lb. above those paid at the previous Auckland sale only a little while before. The better tone in primary markets affected the London sales. Good style merinos were in sellers' favour and sometimes 2½% dearer than on the opening day. New Zealand crossbreds, which had previously been above primary market levels, were unchanged compared with opening rates.

The National Council of Wool Selling Brokers reports that Australian wool cheque for the first six months of the current season, July to December, amounted to £A185,454,000. This is £A7,259,000 less than last year's figure for the corresponding period. Lower wool prices, averaging 68·3 Australian pence per lb. (greasy) compared with 76·8 for the first half of last season, were off-set partly by the increased amount of wool sold. This amounted to 2,208,000 bales, an increase of 178,000. There was a marked drop in the unsold stocks held in brokers' stores at the end of December, the total being 1,400,000, compared with 1,800,000 bales at the close of 1956.

Wool stocks in the U.K. at November 30 last are estimated by the Wool Industry Bureau of Statistics at 231·8 mill. lb. (clean), a decrease of 11·7 mill. lb. compared with the end of October and of 12·2 mill. lb. compared with a year ago. The November stock comprised 83·1 mill. lb. of merino wool and 148·7 mill. lb. of other sorts, both of which totals were lower than a month earlier. Stocks of tops in the U.K. at November last totalled 50·5 mill. lb. or 1·4 mill. lb. less than a month earlier.

Linen Trade Review

The decline in home grown flax production since the war has been a serious matter to the economic stability of the linen industry in this country. While having to meet the competition of Continental manufacturers in world markets, it carries a serious handicap in the form of substantially higher raw material costs because of the considerable freight charges on imported fibre, while Continental mills for the most part are located convenient to the main flax markets. Despite frequent announcements by responsible persons in the trade regarding the need for an assured supply of home grown fibre little real effort is being made to arrest the decline. In recent years a considerable number of scutch mills have closed and the machinery dismantled and sold, the skilled operatives being absorbed in other industries. Current processing capacity would be entirely inadequate to cope with an emergency such as that presented when Continental markets were lost following the invasion of France, Belgium and Holland in 1940.

Flax prices just announced for the 1958 N. Ireland crop provide no stimulus for expansion in this centre. The rates are similar to those for 1957—which, in turn, were responsible for the substantial decline in acreage sown last year. Grade 1 dam retted and hand scutched fibre is rated 31s. 0d. per stone, with a reduction of 1s. 6d. for each succeeding grade. Machine

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scutched fibre is rated 1s. 6d. per stone higher. Rescutched tow prices are: Grade 1, £98; Grade 2, £87; Grade 3, £70 (all per ton). The foregoing are minimum rates which would be adjusted upward if world flax prices rise above these levels.

Continental raw material markets are gradually resuming normal activity following the Christmas recess. Buyers are more in evidence, although discriminating in their purchases. Work in the scutch mills has been curtailed owing to weather conditions, and with limited stocks of scutched fibre on hand prices are firm. Low grade flaxes are still best sellers. Any lots of top grade fibre on offer find a ready market also, but the quantity available is small.

The beginning of the year is normally a quiet time so far as placing new business is concerned. The reduction in spinning and weaving capacity over the last few years has brought production into closer relationship with demand, so that most mills and factories are now in a position to maintain output at, or above the minimum economic working level without undue accumulation of stocks. In the yarn section current demand is better in the coarse end. Mills specialising in prime warp numbers have no difficulty in clearing production. Cambric spins are also firm.

Despite the fact that almost 50% of the industry's cloth output is now of man-made fibre yarns coverage of looms on all linen and union fabrics is barely sufficient to maintain continuity of production. Several factories have closed during the last few years, and it has been announced that Millbrook Weaving Factory, belonging to Ballymena Manufacturing Co. Ltd., is to cease production at the end of the month.

Man-Made Fibres and Products

In general, the year began with a somewhat disappointing start. Sales declined in many sections of the Lancashire trade, and it was speciality and novelty lines which held the main appeal. Even now business is slow for the cheaper end of trade generally, but the medium to better end of the trade in dress fabrics and furnishings is still very good, with a bit better tone attaching to a few export lines in limited styles. Filament constructions have not sold anything like as good as those cloths composed of staple or blended staple yarns. Furnishing fabrics are reported to have been reasonably well supported in recent weeks, however, and most classes of woven and printed designs in roller and screen examples have found some interested outlet.

The demand for yarns featuring blends of "Terylene" and cotton on the cotton system is reported excellent and to exceed available supplies but as more spinners put more spindles on blends of this type there should be an easing-up in the supply situation. Manufacturers report some very encouraging interest from export sources for fabrics of "Terylene"/cotton. "Terylene," of course, is firmly established in the Yorkshire trade, and despite some reported slackening-off in the call for worsteds in the U.S., there is no easing up in demand for blends of "Terylene"/wool worsteds. On the woollen side, a steady demand continues for wool/viscose blends for heavy furnishings and in certain coating and suiting cloths.

Macclesfield and Leek trade is now fairly active, after a rather quiet spell in the immediate pre-Christmas period. Macclesfield weavers are fairly well employed but order books are not as good as many would like at present. Commission dyers are active and printers, machine and screen, are reasonably employed, although some report delay in engraving of new designs. Throwsters report a decrease in the orders for rayon yarn and an increase in nylon and "Terylene." On the whole, trade throughout 1957 was fairly well maintained, although there was the usual falling-off around Christmas. Activity was similar to that of 1956, generally speaking, probably at the expense of keener profit margins. Interest in crimped yarns remained very good and demand for hosiery yarns was maintained throughout the year. The export side of the dyeing and finishing trade tends to shrink, it is reported, as more countries establish their own plants but most local firms remain confident about prospects.

Knitwear manufacturers found 1957 to be a rather better year than 1956. Although business tended to be patchy in some quarters, the overall position was better. Braids and trimmings are slightly better compared with pre-Christmas but the prospect for 1958 is obscure. There is a lag in fancy braids for trimmings but one or two manufacturers report an increasing demand for industrial braids.

In the Midlands trade, business is fairly brisk and manufacturers continue to absorb large weights of Lancashire hosiery yarns also blended specialities including cotton/nylon and cotton/viscose. Although trade in ladies' hose is extremely competetive, good business is reported in all lines including seam-free hose. In the men's trade, spun nylon half-hose is in good request, but by and large the position is one of fierce competition, arising from Continental knitters able to compete on extremely attractive terms. Much of the Italian knitwear, indeed, is of a high quality and styling. One of the big headaches for British trade generally, not only in the Midlands but throughout the country, has been the New Zealand import restrictions, and following on the efforts of the textile industry to increase exports to Canada as a result of the recent Trade Mission's visit, the growing unemployment situation there is not helping things.

Jute Fibre, Yarn and Fabrics

Raw jute markets in Pakistan at the end of 1957 were quiet, but a certain amount of weakness appeared later followed by easier prices. Lack of demand from consuming countries is the main reason but at the same time there has been some improvement in arrivals of loose jute from up-country in East Pakistan. Offers of fibre are freely made excepting the higher grades of white jute. Shippers appear to be holding considerable quantities of the lower grades difficult to dispose of. The loose jute which has been purchased by balers has on selection yield only small quantities of fibre suitable for baling into the higher grades. At the world jute conference at Dacca, East Pakistan, towards the end of 1957, it was more or less agreed that the area under jute cultivation next season would be increased to prevent any scare of a shortage. However, later reports indicate that the Advisory Board appointed by the East Pakistan Government for fixing the acreage has recommended a production target of fifty lakh bales of jute for season 1958-59, and this is certainly not in keeping with promises made at the world conference.

Demand for raw jute has been poor, and U.K. spinners have not shown much interest. Shippers appear anxious for business to liquidate their stocks (which are considerable) of the lower grades of white jute. The price margin between the various grades has widened and tends to continue. Lower grades are cheaper whilst higher grades have shown little change.

Mill Firsts, available at £114, are scarce and some sellers ask as much as £5 per ton more. Mill Lightnings are offered at £97, Mill Hearts at £87 10s. and grade Hearts at £75 10s., c.i.f. U.K., Jan./Feb. shipment. Grade Tossa-2/3 is available at £105 10s. and grade Tossa-4 at £98, with crack Daisee-2/3 at £97 10s. and grade Daisee-2/3 at £89 10s., c.i.f. U.K., Jan./Feb. Dundee spinners are purchasing only small quantities which are generally equal to their weekly requirements. Stocks of raw material held by Dundee spinners are lower than usual for the time of year, but this is due to a shortage of yarns orders and spinners are only covering needs as yarn contracts are placed.

Demand for yarns just before the end of the year increased slightly but the position is now quiet again. Many spinners are operating in a hand-to-mouth fashion with orders on their books for only two to three weeks ahead. Production is below normal and this may become more serious if demand for yarns does not increase in the immediate future. The one bright feature is the steady offtake of jute yarns by the carpet industry but this only helps a portion of the trade here. Cloth is also quiet with the business being placed confined to small orders for quick delivery. Most descriptions of cloth can be obtained in the near position and some manufacturers are holding fair stocks. This does not help the position, as consumers realise that it is not necessary for them to place orders for forward delivery with the present quietness in Dundee. The heavy end of the trade such as sackings and tarpaulins is also quiet with only small orders for early delivery. The industry regards this present quietness uneasily as it has persisted for a considerable time with no signs of an early improvement.

The Calcutta goods market showed an easier tendency at the beginning of January. Control here has shown a little interest and some business has been placed for hessians. Quotations are at 59s. 11d. for 10 oz. 40 ins., and at 46s. 2d. for 7½ oz. with 11 oz. 45 ins. at 66s. 2d. per 100 yds. f.o.b. Calcutta for January shipment; B twills are at 158s. 7d. January. Stocks of hessians held by the Indian mills at the end of December were lower by 1,000 tons but sacking stocks were greater by 4,000 tons compared with the position at the end of the previous month. There has obviously been some switching of looms between hessian and sacking production to give these figures.

The Scottish linen remains quiet with a definite lack of demand for both yarns and cloth, despite the fact that prices are at a low level compared to other materials. Restrictions on imports by some consuming countries is bound to effect production until new outlets are found. Raw material markets are quiet and prices of certain grades of flax continue to decline. Spinners are holding considerable stocks at present and very little interest is being shown in Continental or other flaxes.

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At least half the cost of packing goods in hessian is labour, because it's skilled work. But with Quick-Wrap Hessian Tubing any unskilled worker can be a packer —and pack three to five times faster—because this is hessian pre-sewn on the bias into tubes. It saves the skill (and time) needed to cut and measure hessian for hand sewing. And it stretches and moulds itself to the product so well that you actually save about 33% hessian on each package. It looks smarter, too, and your customers will find it easier to open.

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Notes and News

Cotton Board Appointment

Mr. L. Sharp, J.P., has been appointed to the Cotton Board to represent the interests of persons employed in the industry in finishing. Mr. Sharp is the general secretary of the National Union of Dyers, Bleachers and Textile Workers.

Imports of Yarns and Cloth from China

Imports into the U.K. of cotton and rayon yarns and cloth from China are to be subject to quota restrictions. There will be a home market quota to the annual value of £150,000 and a quota of £1·5 million for grey cloth for re-export after processing in the U.K. The open general licence is being amended accordingly.

The Cotton Board recently drew attention to the steep rise during 1957 in U.K. imports of textiles, almost entirely cotton grey cloth, from China. They amounted to approximately 28 million sq. yds. compared with 9 million sq. yds. and 5 million sq. yds. in 1956 and 1955 respectively. The new quotas permit imports at approximately the same level as in 1957.

Register of Translators. Eccles Public Libraries

This register of translators in the greater Manchester area has been compiled on behalf of the libraries of Eccles, Salford, Swinton and Pendlebury, and Urmston from information supplied by the translators. One hundred and five translators are listed and numbered and each name has symbols indicating the type of work, commercial, literary, scientific or technical, preferred. In some cases the fees are specified. The index is arranged to make easy the selection of translators willing to undertake work between particular languages.

Tentative Textile Standard No. 49

A "Method for the Quantitative Chemical Analysis of Mixtures of Viscose Rayon and Cotton" is announced by the Textile Institute in Tentative Textile Standard No. 49. The method is applicable, after the removal of added matter, to mixtures of viscose rayon with unscoured, scoured kiered, or bleached cotton. The viscose is dissolved at room temperature (15-25°C.) from a known dry weight of the mixture by means of sodium zincate solution. The residue of cotton is collected, washed, dried and weighed; its weight is corrected for loss in the solvent, and expressed as a percentage of the weight of the mixture.

Lord Hailsham Visits Shirley

On January 21, Viscount Hailsham, Lord President of the Council, accompanied by Dr. H. W. Melville, secretary of the Department of Scientific and Industrial Research, paid an informal visit to the laboratories of the British Cotton Industry Research Association, at Didsbury. As Lord President he is responsible, among other things, for the Department of Scientific and Industrial Research, under whose aegis Shirley Institute functions. In the course of his visit Lord Hailsham made a tour of the laboratories and experimental workrooms, and saw something of the Institute's work on industrial diseases with special reference to byssinosis, and testing of cotton and all man-made fibres. He was also shown the latest extension of the use of the "Shirley" automatic size box where the sizing ingredients are fed, in automatically controlled quantities, to the size box. He also saw the productivity and efficiency survey work undertaken in the spinning, weaving and finishing sections of the industry, and in chemical engineering, including work concerned with the simplification of the ageing process for printed fabrics by the use of the "Shirley" flash ager. At the end of his visit Lord Hailsham gave a short interview to the press to whom he expressed his admiration for the work being done at the Institute.

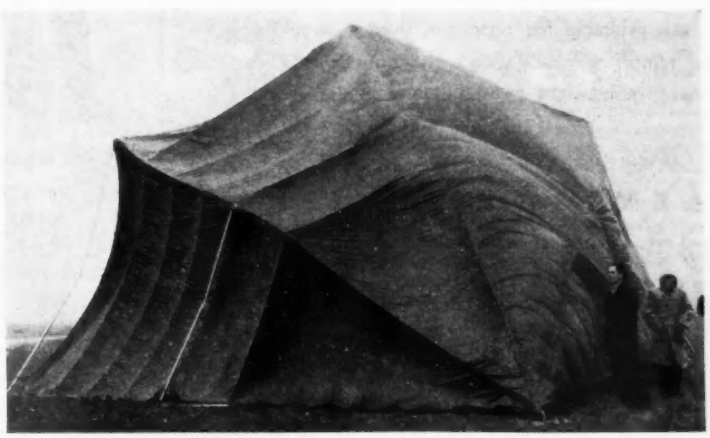
Stretch Yarn Patents

Canadian Patents 552,103, 552,104 and 552,105 covering the process and apparatus for manufacturing stretch yarn by the continuous or false-twist method have been granted to Universal Winding Co. The claims allowed in the patents cover broadly the stretch yarn apparatus manufactured by Universal and also the manufacturing process licensed by the company. Certain basic thermo-processing claims contained in the patents also cover the Model 511 attachment to their ring twister, which Universal is marketing for the production of "Saaba" bulk yarn. Universal states that the bulk yarn produced by this post-treating process shows great promise for use in both knitted and woven garments. They claim that "Saaba" yarn can be tailor-made for specific uses by means of the process which controls temperature and tension. They point out that with the proper control of these elements false-twist stretch yarn post-treated on their 511 attachment can be given widely different characteristics covering the full range from true crepe to smooth woven and knitted fabrics. They state that heavy deniers such as 200 and 400 den. yarn can also be processed economically on the 511 attachment. Most of the yarns produced today for bulky knits are made by plying several ends of 70 den. yarn.

India's Limit on Wool Imports

India's imports of raw wool and tops for the current 12-month period must not exceed in value nine crore rupees (approximately £6,750,000). This decision has been made by the Government after further consultation with the trade. Imports for the previous 12 months, with the price level higher than at present, were valued at about 11 crore rupees (approximately £8,250,000). This year's nine crore rupees will be allocated on a past consumption basis. There will be an export incentive. Manufacturers who undertake to export a specific quantity of finished wool products within a certain time may claim in advance an additional quota of foreign exchange of up to 75% of the value of the goods to be exported. In past years wool hosiery has been the chief export item, although Russia has bought worsted cloth recently. It is expected that the incentive scheme will encourage a more strenuous effort.

Portable Shelter



Polyurethane-proofed nylon supported by a light alloy framework has been used to make this portable shelter. It is large enough to take an aircraft with a 40 ft. wingspan but weighs only about 10 cwts. This photograph, taken from the side of the structure, clearly shows the hinged struts at the back which enable the whole of the front section to be raised to provide easy access. Either front or back can be raised as desired (nylon shelter by Airborne Service Equipment Ltd.)

the problem

of leakage

THE PROBLEM OF LEAKAGE from the glands of rotary shaft equipment—pumps, agitators, mixers, etc.—is one that faces every engineer. Dirt, danger, mess, loss of product and time wasted on repacking are all examples of the direct effects of such leakage.

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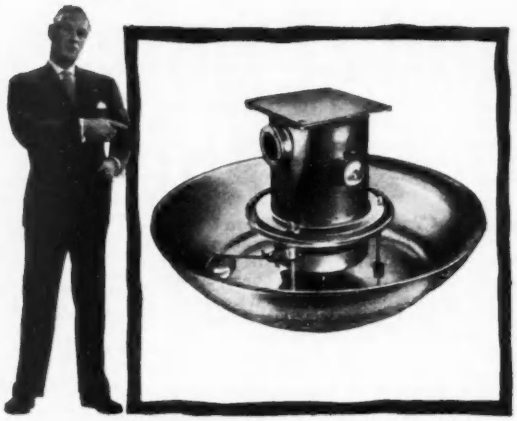

The Aerosol-Turbo?

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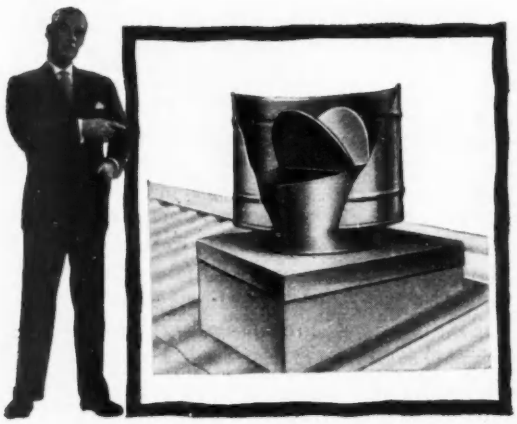

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Dutch Screen Printing Equipment

A. E. Aspinall Ltd., 16 Cumberland Street, Manchester, 3, have been appointed agents in the U.K. and Eire for Gebr. Stork and Co's. Apparatenfabriek N.V., Amsterdam, manufacturers of automatic screen printing machines and ancilliary equipment. Several of these machines, already installed in Britain, are reported to be operating with considerable success.

Grafton Furnishings with "Calpreta-fixt" Finish

All Grafton furnishings, starting with a complete range of over 50 new designs on cottons, rayons, linens, and mixture cloths are now available in the shops and sold with a guarantee that they will not shrink or stretch. The "Calpreta-fixt" finish, an extremely important development which is claimed to be permanent, renders furnishing fabrics dimensionally stable so that they will neither shrink nor stretch, and curtains and loose covers can be made to the correct size with confidence that they will retain the same fit so long as the fabric lasts. They are also reported to be easier to wash, quicker to dry, and easier to iron, and the finish improves their draping qualities. The finish is equally permanent to home washing, laundering and dry cleaning and, of great importance for curtains, it is non-absorbent to chlorine.

The greater part of the new Grafton range consists of three qualities which have proved so popular in recent years—"Homecraft," "Antique Satin" (plain and figured), and a heavy cotton bark weave "Sherwood." The designs for these, and the additional qualities, have been collected from the leading studios of Britain, France, Switzerland and Germany, and coloured with imagination and subtlety. All the new furnishings will be immediately identifiable by a distinctive white selvedge on which is printed the "Calpreta-fixt" non-shrink non-stretch guarantee. The complete range has been enthusiastically taken up by the trade, and the U.K. distributors, Charles Hodges and Co. Ltd., 1/2 Berners Street, London, W.1, are said to have sold, since the new furnishings were first shown to the trade, more than twice their best ever sales in any comparable period since 1904.

American Management Techniques

Werner Textile Consultants Ltd., New York, N.Y., U.S.A., have announced that the spring session of their semi-annual "Appreciation Course on Modern Textile Management" will be given April 16–30, 1958. The course will cover American textile methods and techniques in management, manufacturing, marketing, administration and human relations. Additional information may be obtained by writing directly to Werner Textile Consultants, 60 E. 42nd Street, New York, N.Y., U.S.A. The cost of the two-week seminar is $500.

Cotton Prices in West Nigeria

Seed cotton prices to producers in Western Nigeria are fixed for this year's season at last year's level, according to the West Nigerian Marketing Board. This measure is to develop the young cotton industry in the region for which the Board maintains funds to absorb trading losses. Prices to be paid are: Grade 1, 5¾d./lb., Grade 2, 5¼d./lb., and Grade 3, 5d./lb.

Records at Bradford Conditioning House

The Bradford Conditioning House, which reflects the export activity of the British wool textile industry in raw materials, tops and yarns, reported a record year during 1957. The weight of material tested for certification of condition, etc., prior to export, was the largest ever recorded, viz., 115·7 million lbs., which exceeded the previous record of 111·2 million lbs. set up in 1956 by 4·5 million lbs. The number of tests carried out last year, 308,941, exceeded the total for 1956 by more than 11,000. Tops tested last year totalled 82·5 million lbs., compared with 78·8 million lbs. in 1956; wool represented 17·8 million lbs. against 16·6 million lbs.; noils 3·6 million lbs. (unchanged on the previous year); wastes 7·7 million lbs. against 7·0 million lbs., and worsted yarns 2·4 million lbs. against 2·7 million lbs. in 1956. The total weight of material handled during December was 9 million lbs., the highest December total for three years.

U.K. Wool Imports in 1957

The U.K. spent £188,800,000 on wool imports last year. This was the third largest sum paid by Britain for wool in any year since the war, although the quantity imported was smaller than in recent years. The total weight of 1957 shipments to the U.K. was 675,500,000 lbs. (actual), compared with 699,000,000 lbs. in 1956 and 721,300,000 lbs. in 1955, according to the annual trade and navigation accounts of the Board of Trade. Last year's wool imports cost £20,000,000 more than those of 1956. Britain's exports of wool tops and woollen and worsted yarns and cloth last year reached a total value of nearly £140 millions, some £3 millions more than in 1956 and were, in fact, the highest annual export earnings of the industry since the 1951 year of inflated prices.

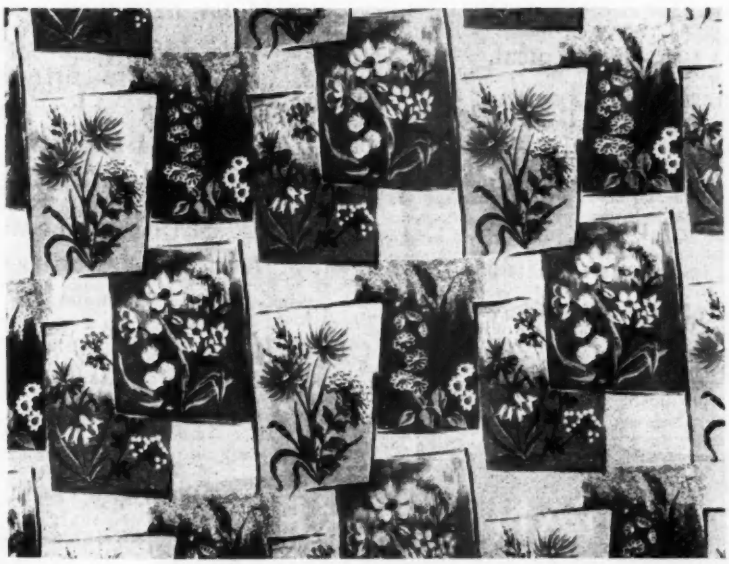
In terms of quantity, British exports of wool tops last year set up another post-war record at 83·2 million lbs., exceeding by 1·7 million lbs. the previous record of 81·5 million lbs. established in 1956. Exports of woollen and worsted cloth failed by about half a million yards to maintain the 1956 level of 104·4 million sq. yds. This is chiefly attributable to a curtailment of shipments to the U.S.A. under the tariff-quota imposed by that country. Most other categories of British wool textile exports maintained or slightly improved upon their 1956 figures, according to details included in the annual trade and navigation accounts of the Board of Trade.

National Insurance

A new edition of the booklet "Everybody's Guide to National Insurance" is on sale at Government bookshops, at all local Pensions and National Insurance Offices, or through any bookseller, price 6d. This 34-page guide explains briefly how the system of national insurance works. The booklet explains the operation of the two schemes of national insurance—the main scheme (compulsory for nearly everyone) and the industrial injuries scheme (compulsory for everyone working for an employer). It gives the new rates of contribution and sets out the new rates of pensions and benefits, the conditions on which they are paid and how and when to claim.

Jute Productivity

The "productivity ladder" scheme run by the Association of Jute Spinners and Manufacturers continues to attract interest among industries in the U.K. and other countries. Articles on the scheme, which is designed to make inter-firm comparisons of labour productivity for different stages of jute processing, have been published in a booklet by the Federation of British Industries, and in the "Productivity Measurement Review" published under the auspices of O.E.E.C.



One of the new Grafton non-shrink "Homecraft" designs with the "Calpreta-fixt" non-shrink, non-stretch finish. The loose floral treatment on a stippie ground has a very fresh, pleasing appearance, and is in three colour ways

A.C. PERIGRIP BRAKES by METROVICK

Metrovick Perigrip brakes are the outcome of extensive investigation into the mechanical, magnetic and electrical characteristics of brakes. They are exceptionally simple to adjust and dismantle and they are invaluable for use with cranes, hoists, haulages, rolling mill auxiliaries, machine tools, certain textile drives and indeed for any drive where POSITIVE STOPPING is required.

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RECENT TEXTILE PATENTS

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763,716 Sized Bast Fibre Yarn

NOVIVLAS N.V., *Delft, Holland.*

A process for the production of sized yarn from green, mechanically broken, bast fibre material by spinning the bast fibre into a roving, treating the roving with alkali, and subsequently spinning the resulting material in the wet state into a sized fine yarn. The alkali-treated roving or the sized fine yarn is treated exclusively with a solution of chlorite.

764,002 Twistless Staple Yarn

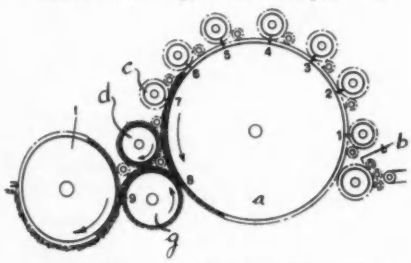
FIBERBOND LABORATORIES INC., 159 *Mt. Auburn Street, Watertown, Massachusetts, U.S.A.*

A method of making a bonded twistless yarn in which staple fibres are first aligned parallel in a thin ribbon-like fibre group and then applied to an adhesive medium bearing surface. The fibre group is pressed against the surface to eliminate excess adhesive and to flatten the group against the surface. The fibres are then formed into a twistless yarn by a rubbing action in which lateral fibres are gathered toward central fibres.

764,234 Roller and Clearer Card

R. PEUKER, 11 *Josef Ruhrstrasse, Euskirchen, Bonn, Germany.*

Describes an improved form of roller and clearer card. *a* denotes the cylinder, *b* the feeding arrangement, *c* are the workers with the strippers, *d* is the fancy and *f* is the doffer. Between the cylinder and the doffer is incorporated an intermediate roller *g*, which empties the

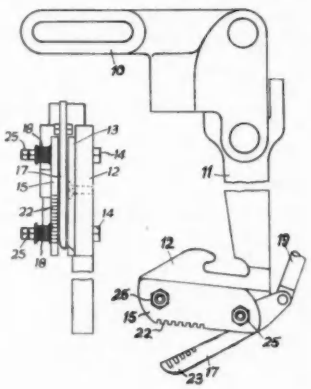


material from the cylinder and transmits it to the doffer. The fancy *d* engages simultaneously in the cylinder and the intermediate roller. The roller *g* is of smaller diameter than the doffer and rotates at a greater peripheral speed than the latter. The direction of rotation of *g* is opposed to that of the cylinder at their point of contact 8; similarly, the set of the wires in opposite directions. The maximum peripheral speed of the roller *g* is equal to the peripheral speed of the cylinder. In the card there are nine working points 1 to 9.

764,595 Weft Clamping on Automatic Looms

W. V. GLEDHILL, *Ty Bryn, Holmfirth, Huddersfield.*

Weft clamping device for use in automatic looms. An arm 11 extends down from bracket 10, a nose piece 12 being arranged to point towards the rear of the loom. A fixed cutter blade 13 is secured to the nose piece and two bolts 14 in the nose piece project through the fixed cutter blade 13 and a floating clamping jaw 15. One of the bolts 14 acts as a pivot for a clamping jaw 17, and a nut on the other bolt acts as a spacer for the fixed cutter blade 13 and the floating jaw 15 when the aw is opened. On the outside of the floating jaw, springs 18 and nuts 25 keep the jaw urged towards the pivoted jaw, which in turn is pressed towards the fixed cutter. The jaw 17 is connected to an operating rod 19 which is connected to the weft change mechanism to cause opening and closing of the jaws of the cutter clamp, by rocking the jaws 17 about its pivot and the pivoted jaw is tapered to assist in drawing the weft thread into the nip of the jaws. The blade 13 is formed with a sharp

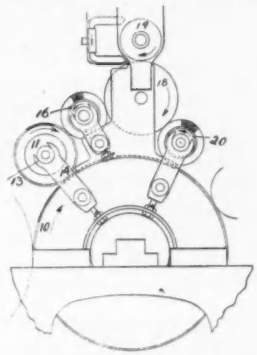


edge to act as a cutting edge in conjunction with a sharp edge on the jaw 17. The clamping jaw 15 is formed with serrations 22, and serrations 23 are also formed across the top corner of jaw 17 on the side which co-operates with the clamping jaw. The opposite top corner of the jaw 17 which co-operates with the blade 13 is sharp. The blade 13 is arranged somewhat higher than the jaw 15 so that the threa d is clamped immediately prior to being cut.

764,966 Improved French Card

PRESTON STREET COMBING CO. LTD., *Preston Street, Bradford.*

The existing breast worker and stripper of a French card are removed and in place of these are secured above the breast roller 10, a divider 11 mounted in bearings 13 held in brackets 14. The divider 11 may be moved towards, or away from the breast roller, as necessary. Held in a similar manner is a first stripper 16 which is adjacent the divider but further away from the lickerin than the divider. The first stripper serves to remove the web from the divider and transfer it to a Morel roller 18 above which is a burr beater 19.



At the side of the Morel roller is an angle stripper 20 which transfers the web back on to the breast. In use the position of the divider is such relative to the breast 10 that it will divide the web coming from the lickerin into two parts.

765,262 Improved Drafting Mechanism

SKF KUGELLAGERFABRIKEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, 13 *Ernst Sachs Srasse, Schweinfurt am Main, Germany.*

A drafting mechanism embodies a top roller carrier arm reaching over at least part of the top rollers, which is mounted on a bracket carried in the framework of the machine by a supporting rod. At least one wedge-shaped clamping member is provided for the bracket, which engages between the supporting rod and an opposed part of the bracket, and can be urged into operative position by tightening means.

765,319 Spinning and Twisting Spindle

MARQUETTE METAL PRODUCTS CO., 1145 *Galewood Drive, Cleveland, Ohio, U.S.A.*

Describes a composite metal spindle blade and whorl unit for spinning or twisting, comprises a central, bolster-supported, hard steel shaft, a light weight metal barrel having a clearance bore surface permanently in interference fit to a mating surface on an upper end portion of the shaft. A steel whorl has a circumferential bore surface in permanent interference fit to a lower portion of the barrel around the upper end of the shaft. Cylindrical, mutually mating, surface portions of the shaft and barrel are spaced apart by means providing continuous clearance all around the shaft and through a considerable distance along the shaft which permits flexure of the shaft within the barrel without its coming into contact with the barrel metal in the clearance space.

765,657 Improved Loom

WEAVING RESEARCH AND TEXTILE COMMISSION AGENTS LTD., *Ballamoar Castle, Jurby, Isle of Man.*

An improved construction of loom which enables weft patterns to be produced having looped and cut ends in a selvedge. The loom has selvedge-loop-forming pins, with a cutter associated with each pin which can sever a loop formed around the pin at the selvedge when a cut end is desired. The cutter blade is so positioned on the pin that the blade only comes into action when the pin is moved deeper into a loop which has been formed around it.

765,712 Measuring Changes in Length of Warps, etc.

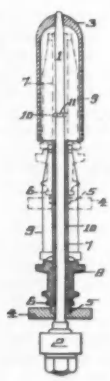
GEBRUDER SUCKER, GM.B.H., *Blumenbergerstrasse* 145, *M.Gladbach, Rheinland, Germany.*

A method of measuring changes in length of threads, webs etc., comprises comparing the lengths of the thread or web that run past two different measuring points during the same interval of time. The change in length may be ascertained by comparing a standard length measured at one point with the actual length measured at another point, preferably both measurements being carried out simultaneously.

765,719 Cap Spindle Lubrication

F. HARRISON, 84 *Halifax Road, Odsal, Bradford,* and W. TURNER.

Improved spindles for cap spinning and similar machines. 1 is a spindle bolted to a rail 2 and furnished with a cap 3, the spindle passing through an aperture in a lifter plate 4 with which is associated a lubricating wad 5 and a washer 6. 7 is a driving tube, furnished with a whorl 8, whose lower end is supported by the washer 6, the tube being adapted to rotate a bobbin 9. Formed in the bore of the driving tube is a groove 10. A groove 11 is also formed in the wall of the spindle



which registers with the groove 10 in the tube when the latter is at the top of its upward traverse. When the lifter plate 4 has raised the tube 7 and lubricating wad to the top of their traverse the grooves register with each other. Oil contained in the groove 10 then automatically transfers to the groove 11. When downward traverse occurs, oil in 11 re-transfers to the bore of the tube and is distributed over the upper part of the spindle not traversed by the wad 5. In this manner, the whole of the spindle which is traversed by the tube may be efficiently lubricated.

765,876 Removing "Fly" During Spinning

W. DIETZ, *Schwachhauser Ring* 153, *Bremen, Germany.*

Apparatus for removing fluff and dust from spinning machines, etc. Air blast nozzles are arranged to blow air across the surface to be cleaned and into a collecting trough connected to a receiver, so as to blow the fluff into the trough and to drive it into the receiver by air pressure created by the action of the air blast. The trough is so shaped as to produce eddy currents which retain the fluff in the trough as it moves along it.

765,979 Looms Lug Strap

S. KAY AND CO. LTD., *Elton Fold Mills, Bury,* and W. BESCOBY.

An improved construction of lug strap for underpick looms which has a much longer life than the present hide or balata lug straps. The lug strap comprises a metal support plate of U shape, the plate forming a support for a buffer element. The lug strap is connected to a picker stick so that the picker stick is reciprocated between the arms of the U and engages the buffer, which latter serves to check and reverse the movement of the picker stick.

766,100 Condenser Roller in Drafting System

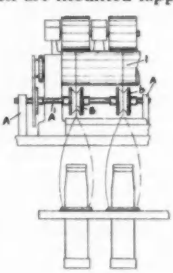
ESTERAVES BALMES, S.A., *Calle Caspe No.* 26, *Barcelona, Spain.*

An improvement of the mechanism for drawing rovings or slivers described in B.P. No. 742,958 in which a fibre-conducting roller bears upon the lower rollers of two consecutive pairs of rollers of the mechanism. The improvement consists in omitting the handle of the frame in which the conductor roller is mounted, limiting this frame to the lower portion, which forms the condenser. The two upwardly directed lateral branches carry, on their inner faces, the circular rims for the rotation of the roller.

766,166 Improved Doubling Frames

S. BOURNE AND CO. LTD., 4 Weekday *Cross, Nottingham.*

Improved ring doubling frames with means for severing a broken end as soon as it becomes entangled with an adjacent end. A bearing pedestal A carries a shaft A^1 on which are mounted lappet bowls B,

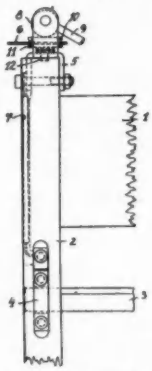


enclosed at their ends by metal caps *b*, each formed with a cylindrical flange b^1 to extend over the end of the bowl. The cap *b* comprises a disc mounted on a hub b^2 and the periphery of the disc is turned inward to form the flange b^1 to enclose the end of the lappet bowl and is slotted at intervals to form a series of cutters b^3. When an end breaks it is drawn across to an adjacent end and caught up in the balloon formed by this end thereby drawing the yarn out of its normal path and into one of the slots between the teeth b^3 by which it is severed, the loose end passing back to the rollers 1 on which it forms a lap.

766,322 Electric Warp Stop-motion

C. WAGNER, 161 *Heppstrasse, Reutlingen-Betzingen, Germany.*

Describes a form of electrically-operated loom warp stop-motion. A contact bar 3 extends between side supports 2 of a heald frame with staves 1. A lead 7 joins



a clamp 4 with a connector 5, by which the stop-motion is connected to a conductor 6 from a suitable electric supply. The connector 5 includes a cam 8, operable by a hand lever 9 which is mounted above two plates 10 and 11. The plate 11 has a pin 12 extending into an aperture in a stationary part of the connector.

766,446 Warping, etc., Creels

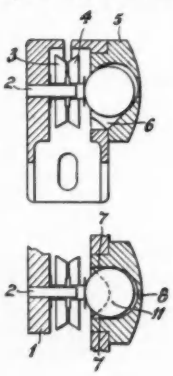
C. WHITEHEAD, 35 *Arthur Street, Shaw, Oldham.*

Creel for use in beaming and cross-ball warping machines. The supports for yarn packages are mounted so as to be swingable about an axis which passes transversely through the packages midway of their length, so that replenishment of the packages may be effected from a direction other than that in which the overend withdrawal of the yarn occurs.

766,517 Tensioning Device for Winding Frames

VEB SPINN- UND ZWIRNEREIMASCHINENBAU KARL-MARX-STADT, 8 *Lärchenstrasse, Karl-Marx-Stadt* 31, *Germany.*

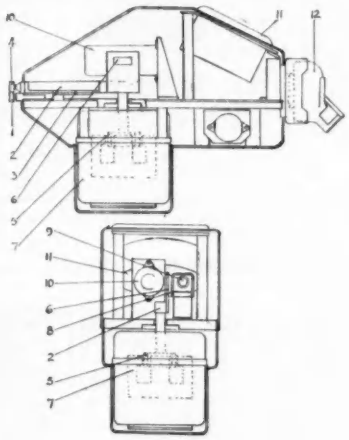
Thread tensioning device, for winding frames. On a bolt 2 are a pair of tensioning discs 3 and 4, and disc 4 is slidable on the



bolt with respect to the disc 3. Desired pressure is applied to disc 4 by a ball 11 bearing against the disc and co-operating with an inclined recess 6 a control knob which has parallel flanks 7 and a hemispherical base 8. By rotating the control knob 5, the ball is caused to move along the inclined recess by virtue of the shape of the flanks 7 and the bottom 8. Marks may be formed on the casing 1 to co-operate with a datum point provided on the knob 5 to serve as a graduation scale for adjusting the knob.

766,579 Tension of Running Yarn
BRITISH NYLON SPINNERS LTD., *Pontypool, Monmouthshire.*

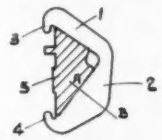
A method of testing the tension of running yarn, by passing the yarn over a moveable guide and the tension of the yarn exerts a force tending to displace the



guide, with provision for measuring the force electrically. 1 is a fixed pulley, 2 a rockable bar, mounted on spring 3, and carrying a pulley 4, a moving coil 5 and a light grating 6. The moving coil is surrounded by a magnetic field due to the permanent magnet 7. The light grating is positioned relative to another fixed light grating 8, a lamp 9 and a photo-electric cell 10. 11 is a milliammeter for indicating the current in the moving coil 5. 12 is a multi-connection plug for a flexible lead which enables the amplifying circuit with the valves and other equipment to be housed elsewhere, so that the electronic head is light and portable.

766,697 Non-Metallic Traveller
FAIRBAIRN LAWSON COMBE BARBOUR LTD., *Wellington Foundry, Leeds.*

A non-metallic traveller so formed to provide correct tension for spinning, together with long lasting properties. The traveller has a partially triangular form having a base 1 of uniform thickness but



with a width expanding from the top, and a perpendicular 2 which increases downwards both in width and thickness to the line A-B. The hypotenuse is represented by the short hooked extensions 3, 4, and the inner faces of both the perpendicular and base are made smooth and of similar forms to the inner surfaces of the ring 5. In a preferred form, the traveller is made from nylon.

766,755 Weft-Feeding Apparatus
SULZER FRERES, SOCIETE ANONYME, *Winterthur, Switzerland.*

Apparatus for selectively feeding two or more different weft threads by means of feeders mounted in a feeder changing element and movable both in the weft path and transversely to this path. There are individual guides for the feeders in the changing element and at least one common guide rigidly mounted on a part of the frame outside the feeder changing element.

767,026 Automatic Warp Stop Motion
F. HINDE AND SONS LTD., *St. Mary's Silk Mills, Norwich.*

An automatic warp motion device includes guide rails disposed across the vertical path of the warp between the beam and weaving position. Droppers are shaped to engage around the guide rail with sufficient play to permit free movement of the droppers across the rail between elevated and dropped positions. Contact means are arranged to abut each dropper, when in dropped position, to complete an electric circuit for stopping the loom. The arrangement of the guide rail is such that the individual droppers can be maintained in elevated position by engagement with separate unbroken warp threads and will fall into the dropped position on thread breakage.

767,030 Improved Shuttle
TOOTAL BROADHURST LEE CO. LTD., *Manchester.*

A shuttle has at least one wear resisting facial reinforcement comprising a facing formed wholly or predominantly of hard synthetic resin such as phenol-formaldehyde, epoxide, polyester or furane resin. The facing is inlaid in a shallow recess in a wearing part of the face of the shuttle, the surface of the facing merging smoothly into the surface of the shuttle.

767,296 Apparatus for Correcting Sliver Variation
G. F. RAPER, *Deepdale House, The Square, Masham, Ripon.*

Improved apparatus for detecting and correcting irregularities of sliver, in which a sliver passes through a drafting unit controlled by the mechanical movements of a relay which is responsive to irregularities sensed by a detector. The apparatus is described in B.P. Nos. 656,135; 710,957 and 711,501. Between the detector and rod setting element, is a link comprising two pivoted arms, one arm being connected to the detector and the other being connected to the rod-setting element. A contact is adjustable on one of the arms, such adjustment causing movement of one arm relative to the other and a simultaneous alteration in the effective length of one or both of the arms.

767,990 Electric Stop Motion
FAIRBAIRN LAWSON COMBE BARBOUR LTD., *Wellington Foundry, Leeds.*

A stop motion for use in drafting, spinning or weaving machine, comprises a light path, photo-electric means responsive to the light traversing the path, a relay controlled by the photo-electric means to stop the machine, and means for modifying the light beam on breakage of sliver or yarn passing through the machine. The photo-electric means is a photocell connected to the striker of a gas-filled cold cathode discharge tube which is normally non-conductive.

768,328 Embossed Pile Fabrics
MOHASCO INDUSTRIES, INC., *Amsterdam, Montgomery, New York, U.S.A.*

Production of a pile fabric having depressed areas providing pattern effects. A fabric is formed having a pile including heat-shrinkable yarns, and the pile is depressed in areas determined by a pattern. Simultaneously the yarns are heated in the depressed portions to a temperature which causes the yarns to shrink.

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THE Proprietors of British Patent No. 728414 are prepared to sell the Patent or to license British manufacturers to work thereunder. It relates to an Improved Device for the Continuous Processing of Textile Filaments and Yarns. Address: Boult, Wade and Tennant, 112 Hatton Garden, London, E.C.1.

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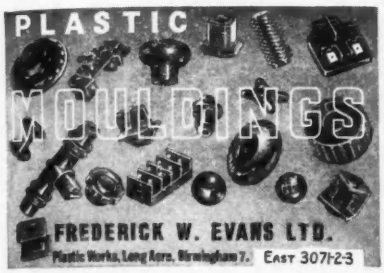

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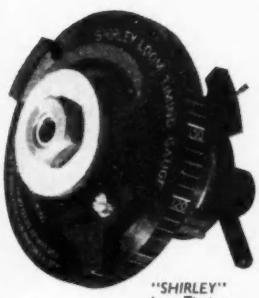

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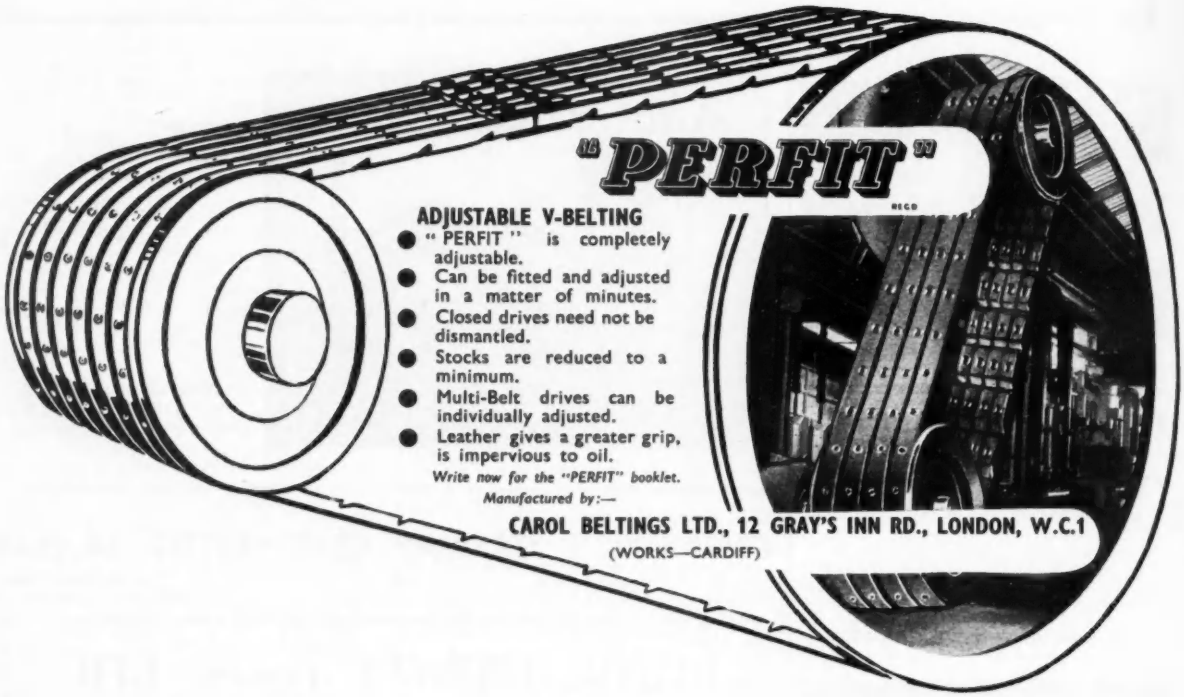

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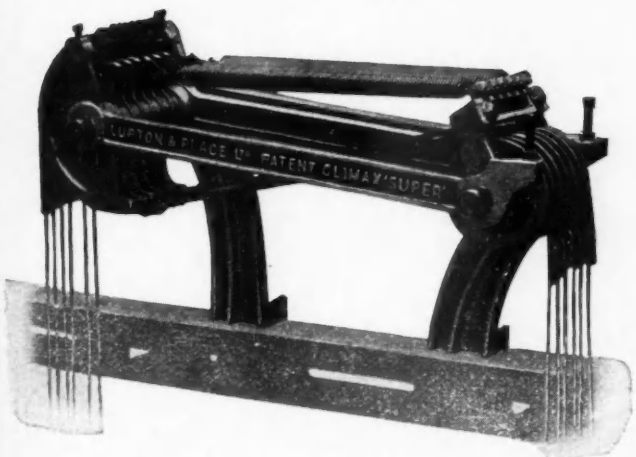

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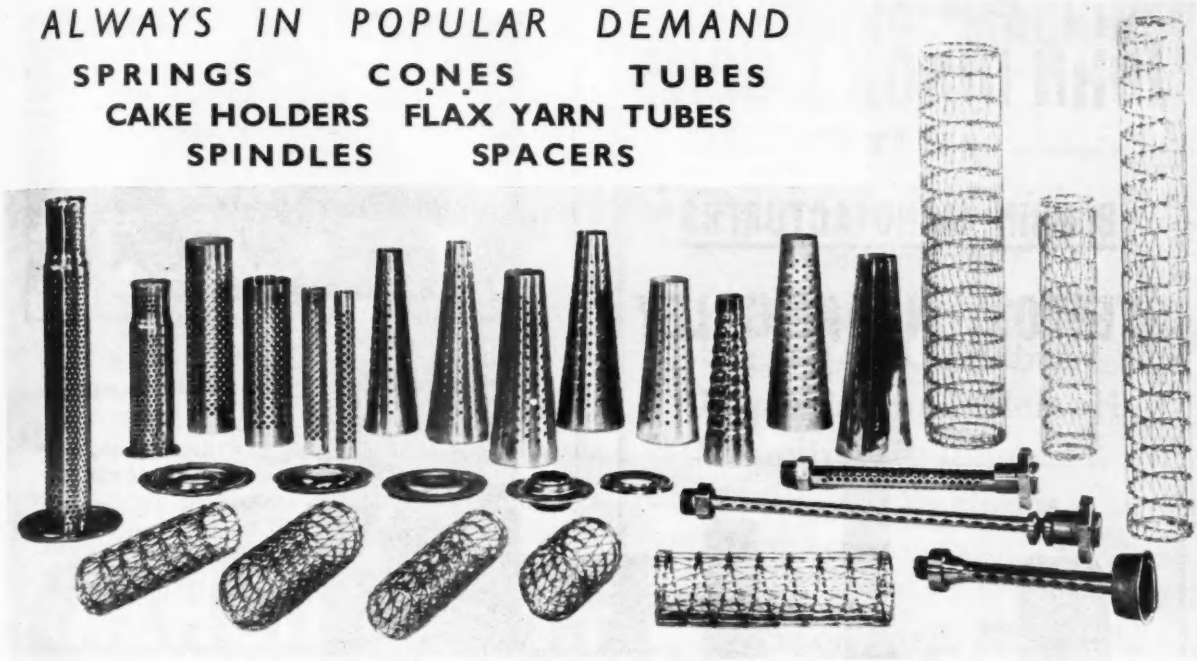

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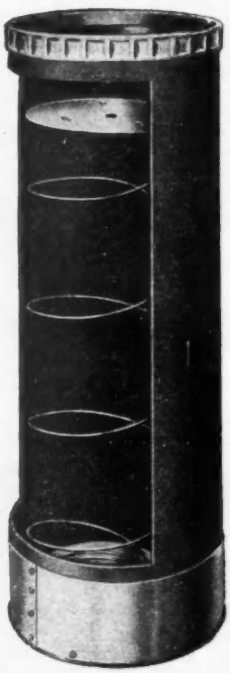

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are solid drawn Siemen's Steel, no rivets or swageing required. Made solely by us in 9 in., 10 in., 11 in., 12 in. and 14 in. diameter.

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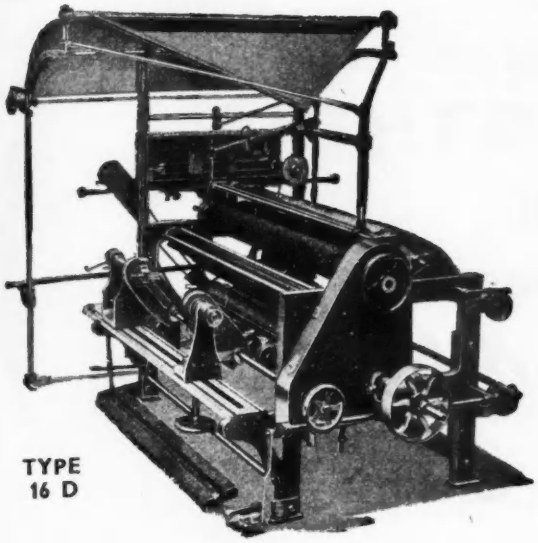

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WORKING CEILINGS

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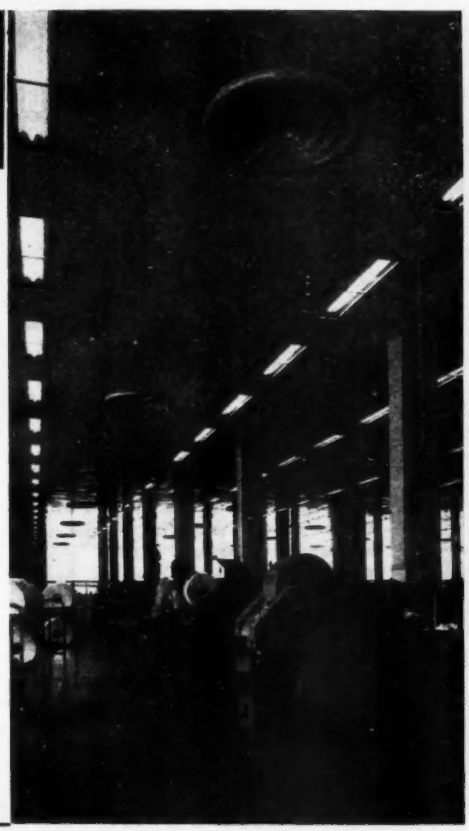

Don't let your ceiling be merely an overhead. Let it work. Fairitt Diffusers are easily fitted into ceiling as standard panels, they give an even draught-proof circulation of fresh heated air, silently and invisibly. This is one of the logically sound applications of air diffusers, that are made possible by the Fairitt principle.

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FOR EVEN FEEDING

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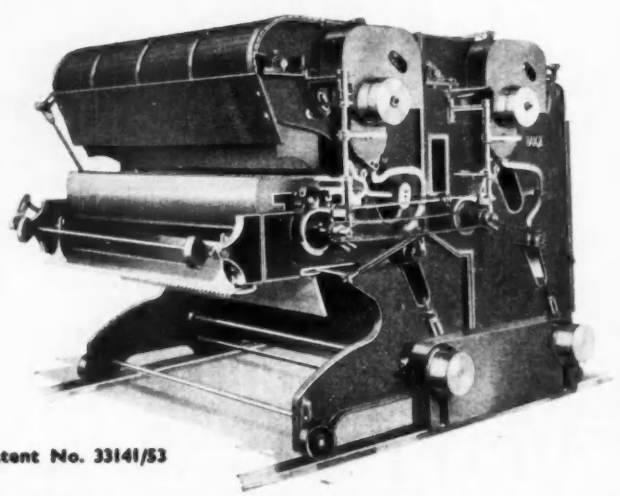
This is done by regulating the input of material according to deliveries to the scale pan.



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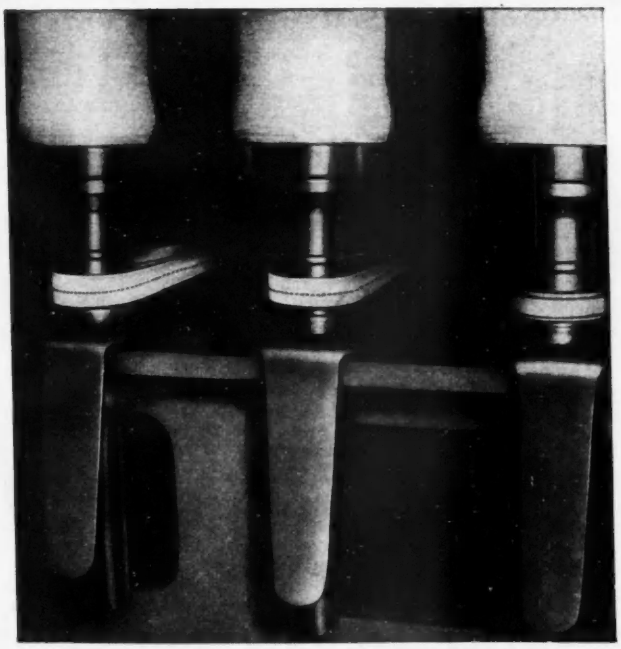

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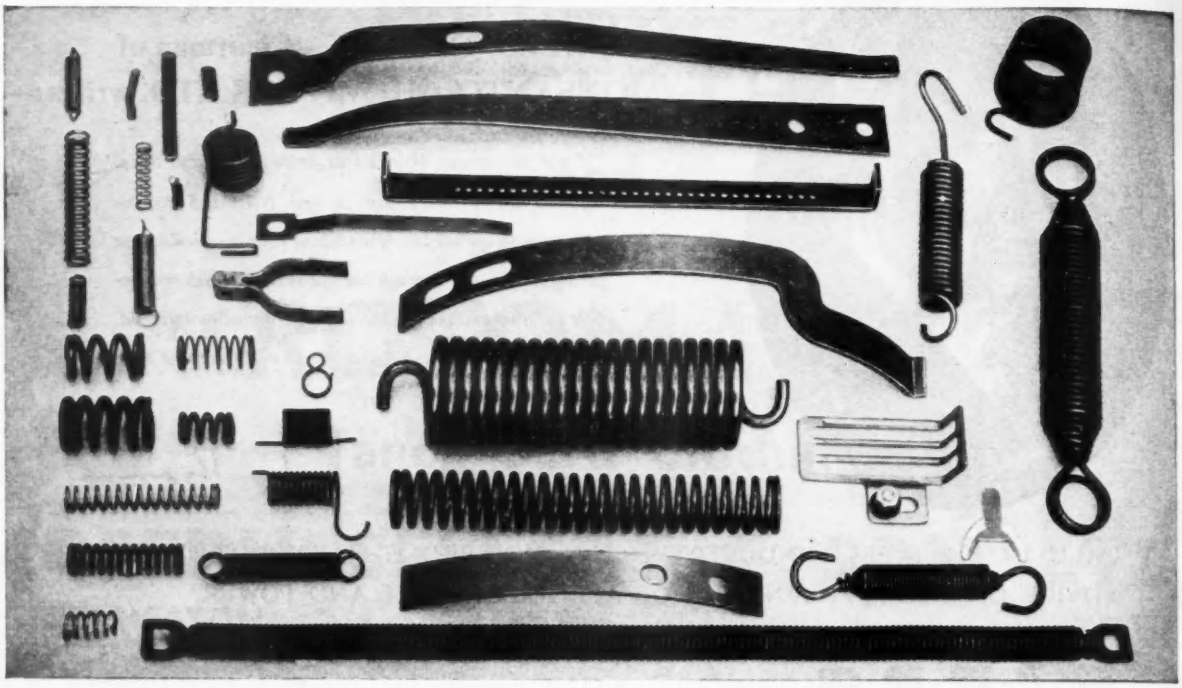

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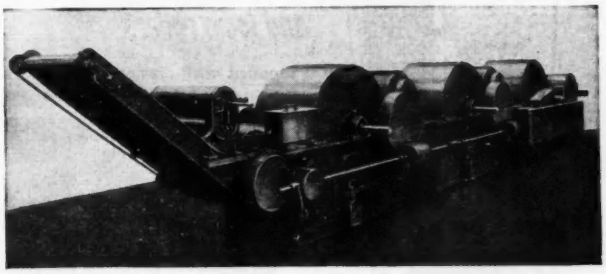
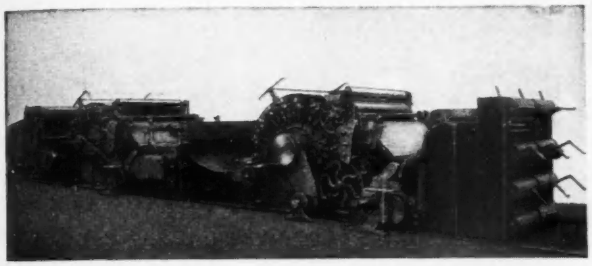
FOR COTTON WASTE and WOOL



Right: Improved Breaking-up Machine of three cylinders.



Left: Set of high production Double Doffer Pattern Carding Engines having Automatic Feed, Breast, Breaker Card, patent Parallel Fibre Feed, Finisher Card and Tape Condenser.

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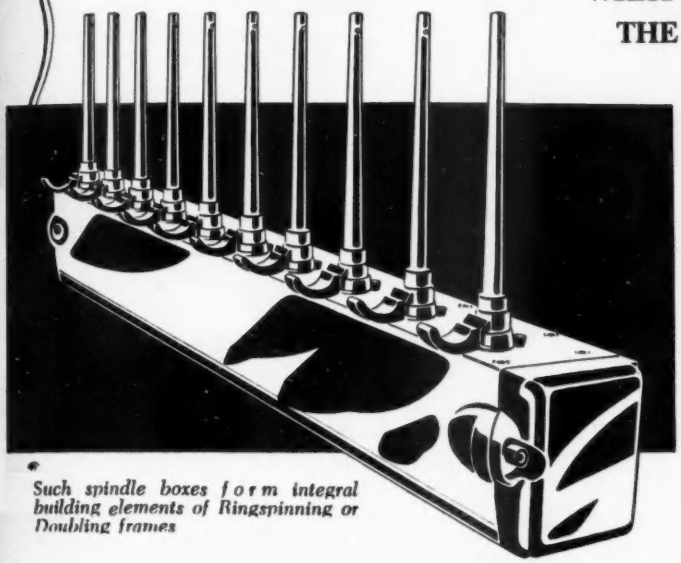
WHAT ARE THE ADVANTAGES OF THE HISPANO SUIZA SPINDLE?



Such spindle boxes form integral building elements of Ringspinning or Doubling frames

Positive drive, ideal lubrication, elimination of tape drive, no slip, no tinroller wind, no centering of spindles.

All spindles turn always with equal speed.

Few ends down, easy maintenance, low power consumption.

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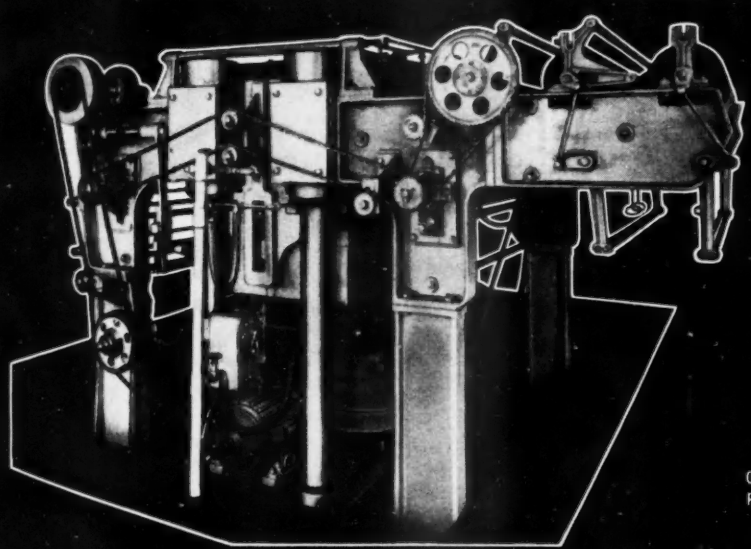

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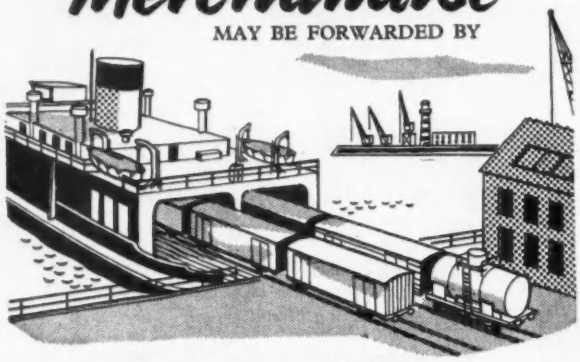

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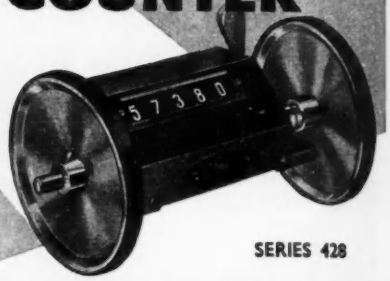

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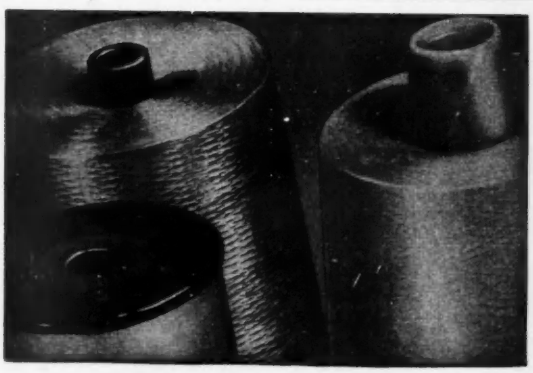

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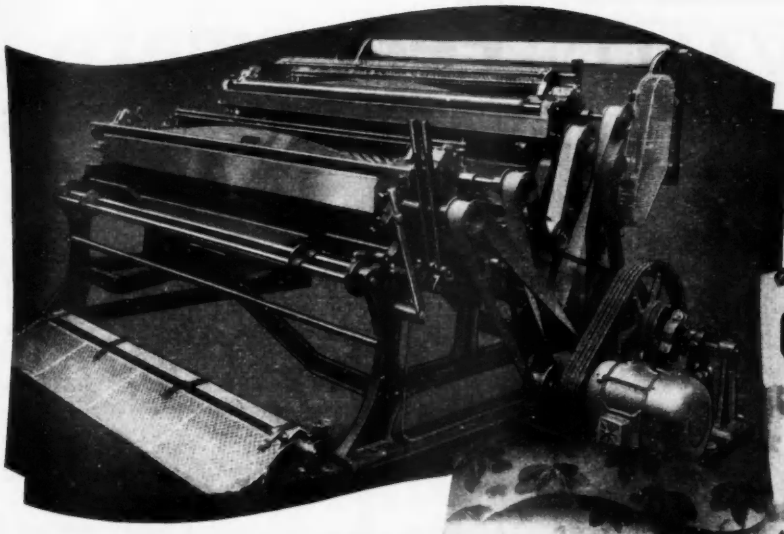

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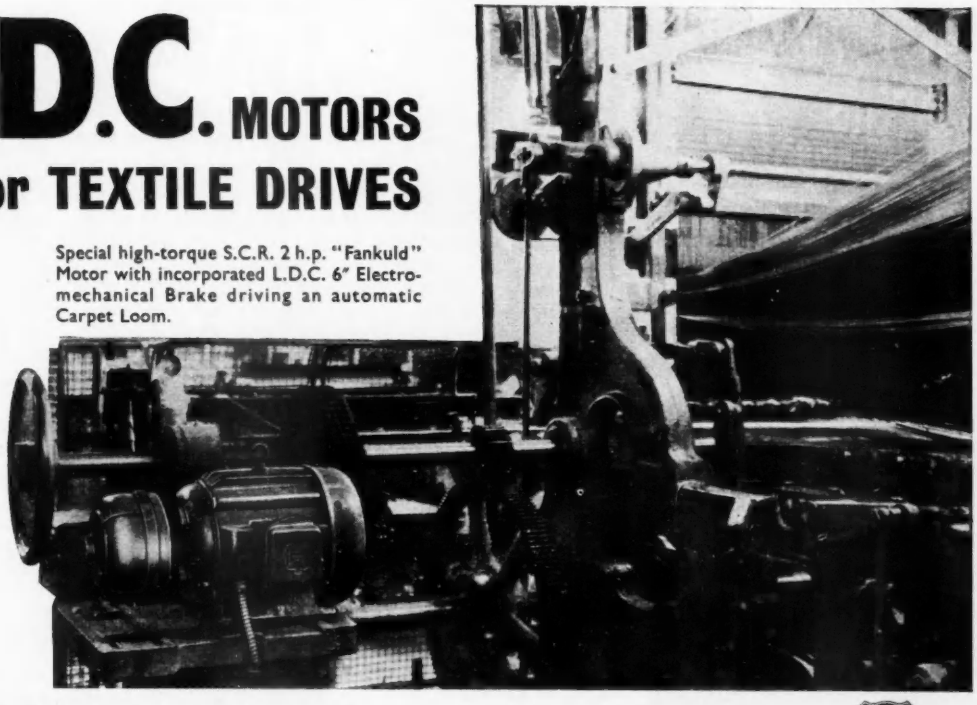

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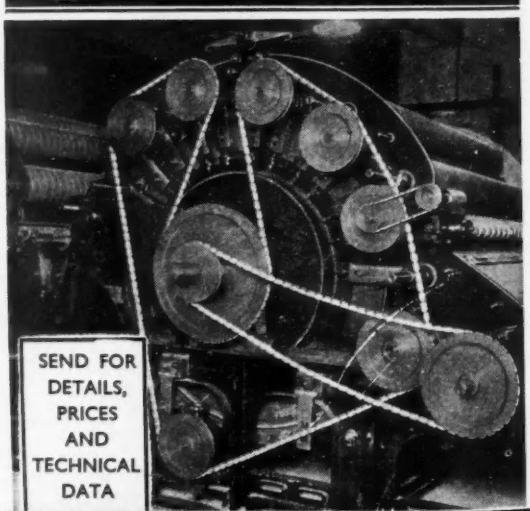

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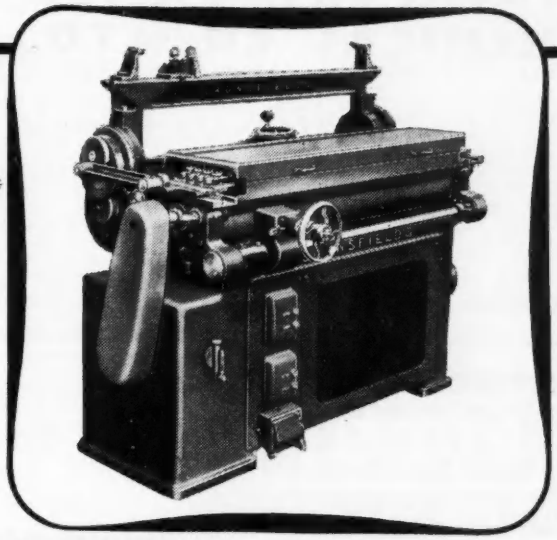

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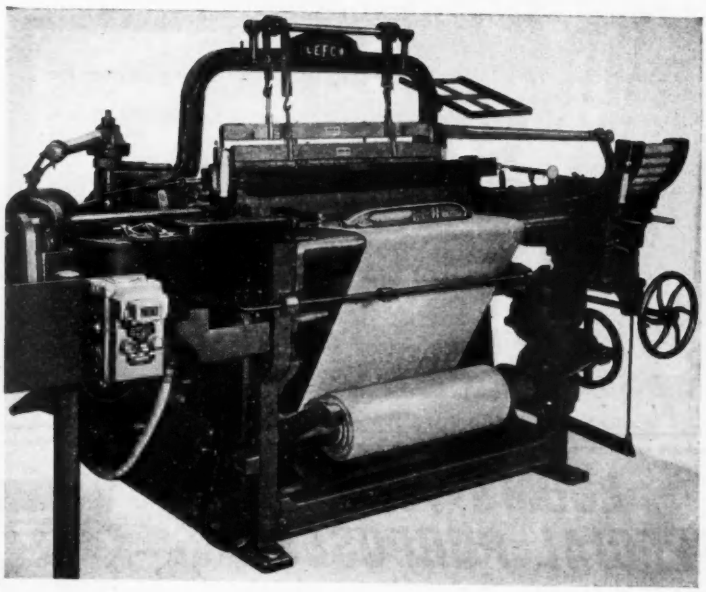

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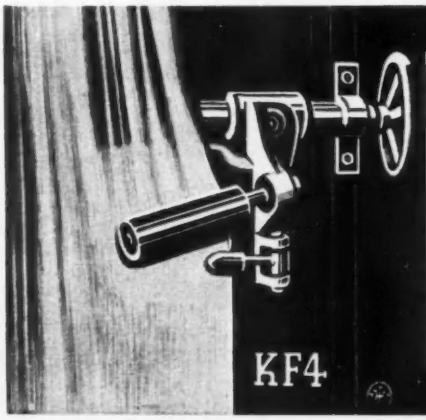

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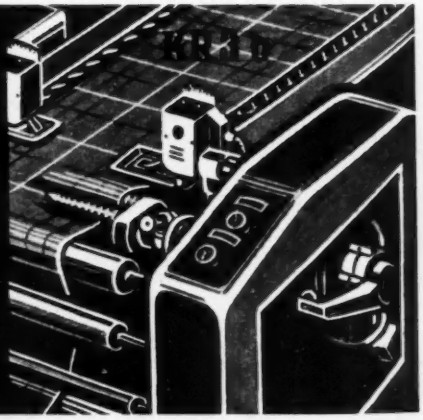

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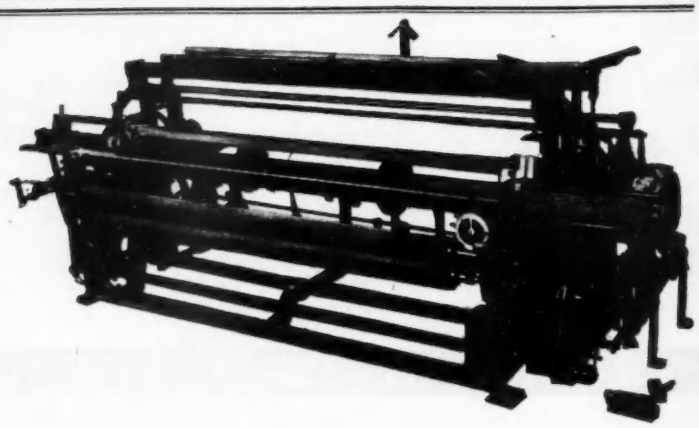

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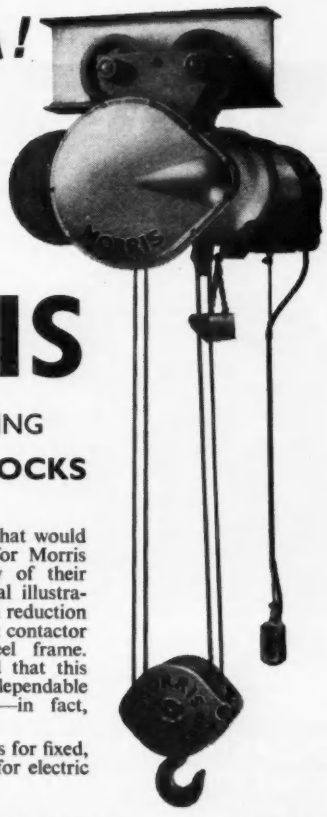

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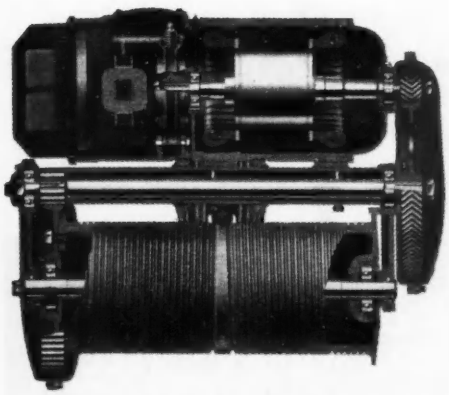

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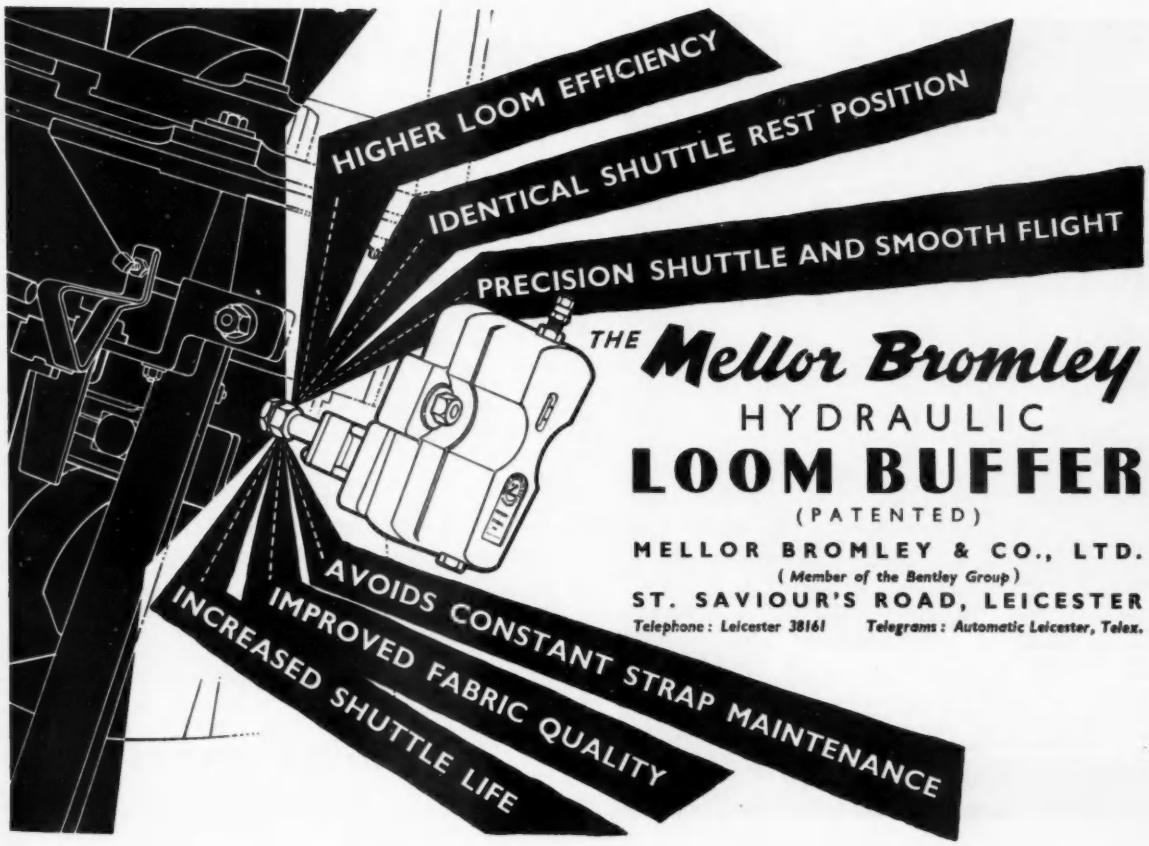

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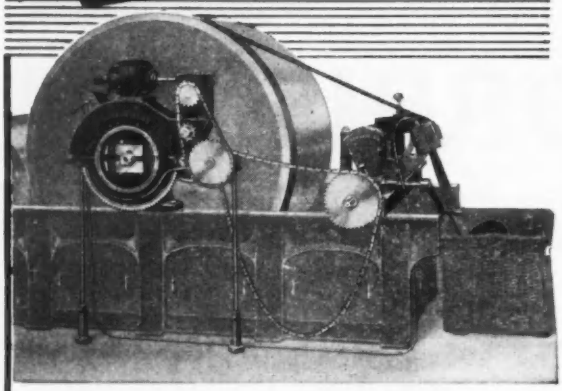

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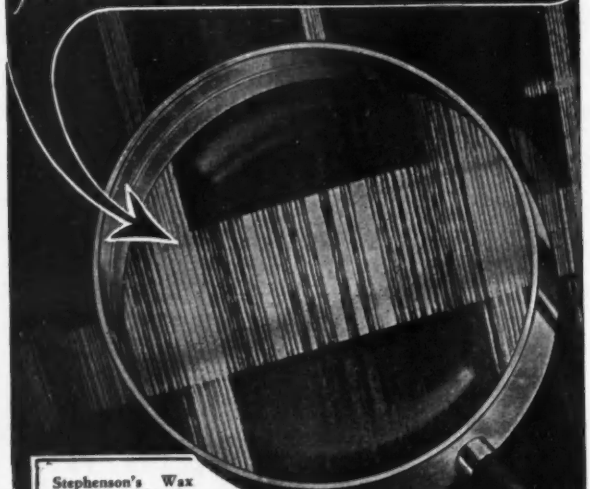

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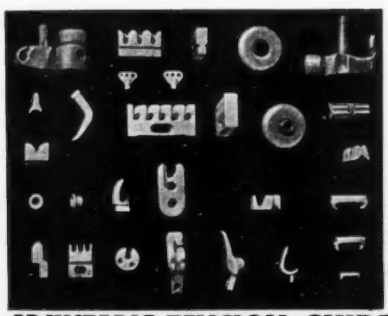

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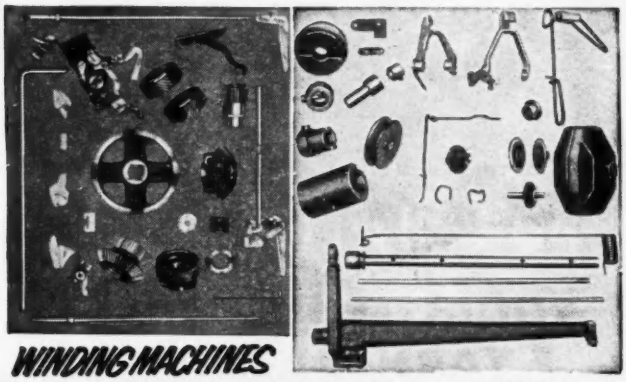

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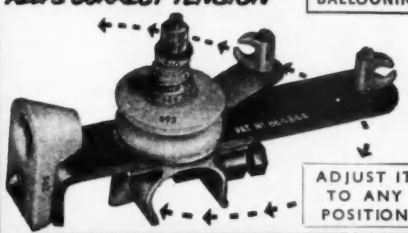

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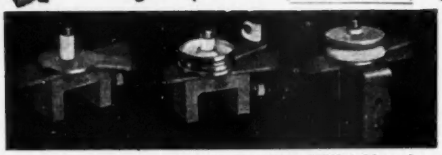

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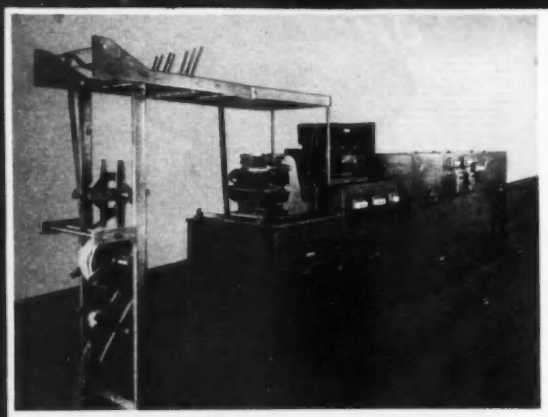

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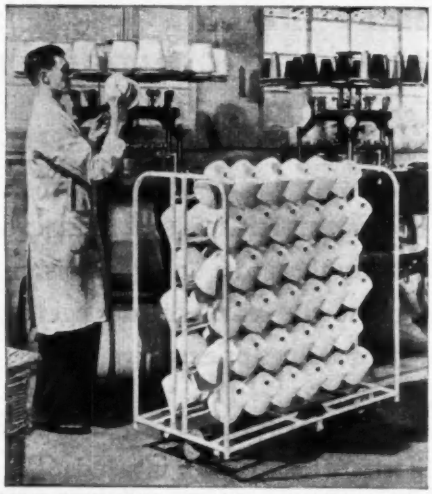

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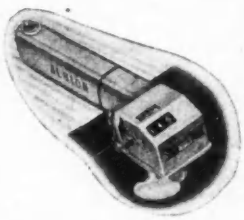

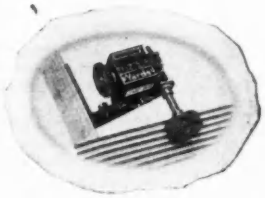

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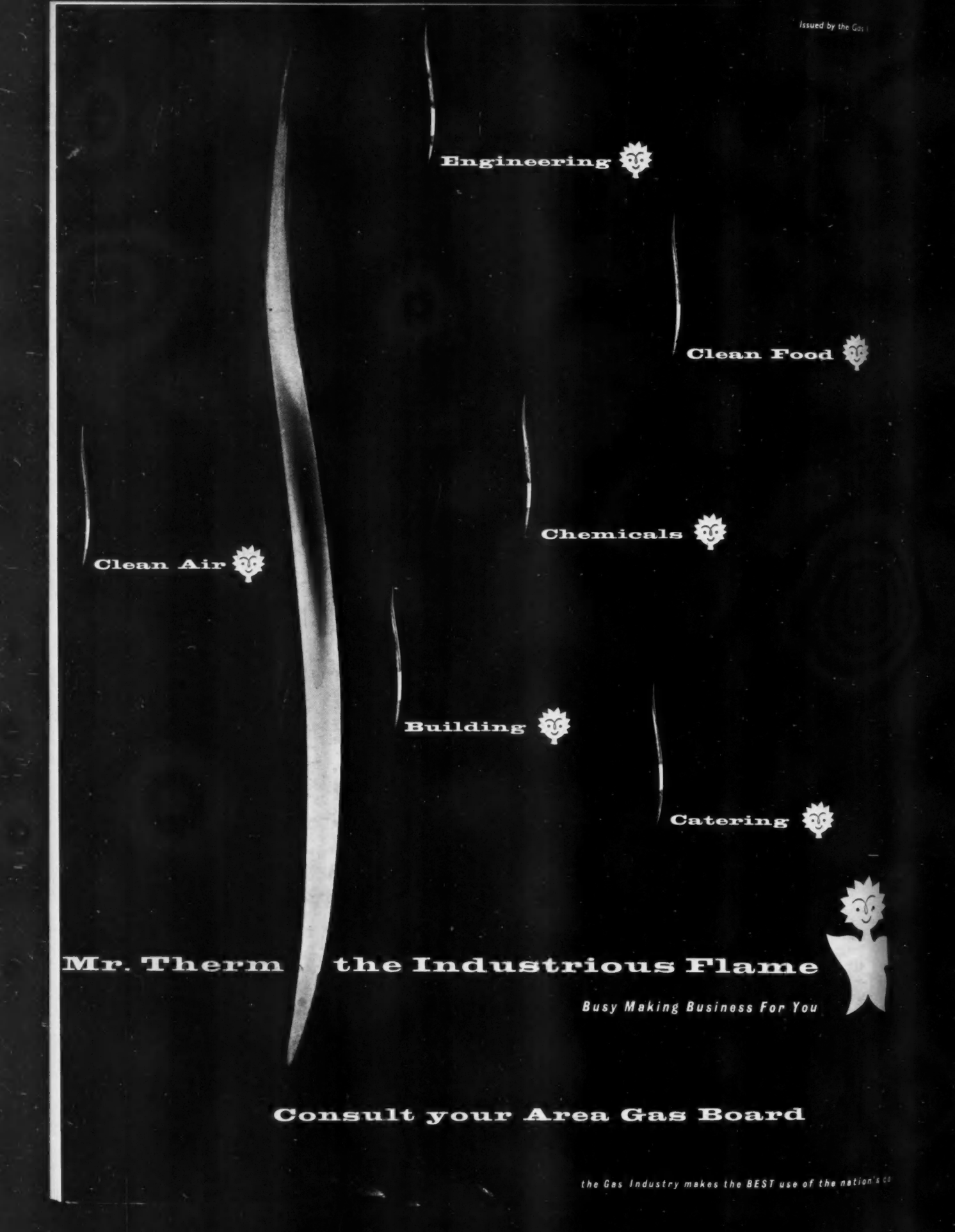

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